SCIENTIFIC AMERICAN

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THE MANCHESTER SHIP CANAL.

The approaching completion of the most important parts of the great works from Manchester to the estuary of the Mersey, and the successful performance, so far, of engineering designs which underwent a prolonged controversy and repeated parliamentary inquiry till three or four years ago, and which the contractor, Mr. T. A. Walker, is carrying into execution by the employment of a vast amount of labor, with the aid of an extraordinary apparatus of machines, must be regarded as a matter of much public interest.

The length of the Manchester ship canal is thirty-five miles, its depth is 26 feet, and the minimum width at its bottom is 120 feet. This is 48 feet wider than the bottom of the Suez canal, while the depth is equal, so that the largest cargo steamers can pass each other in the Manchester ship canal. At several points, near the locks and near the docks, this canal is wide enough for such ships to turn. For a length of three miles and a half, approaching Manchester, the width at the bottom is 170 feet, so that ships can lie outside the docks along the wharves on the Salford side. There will also be open side basins, if required, or widenings at shipbuilding yards, or where cargoes are discharged or loaded, for manufacturing establishments or storehouses adjoining the canal.

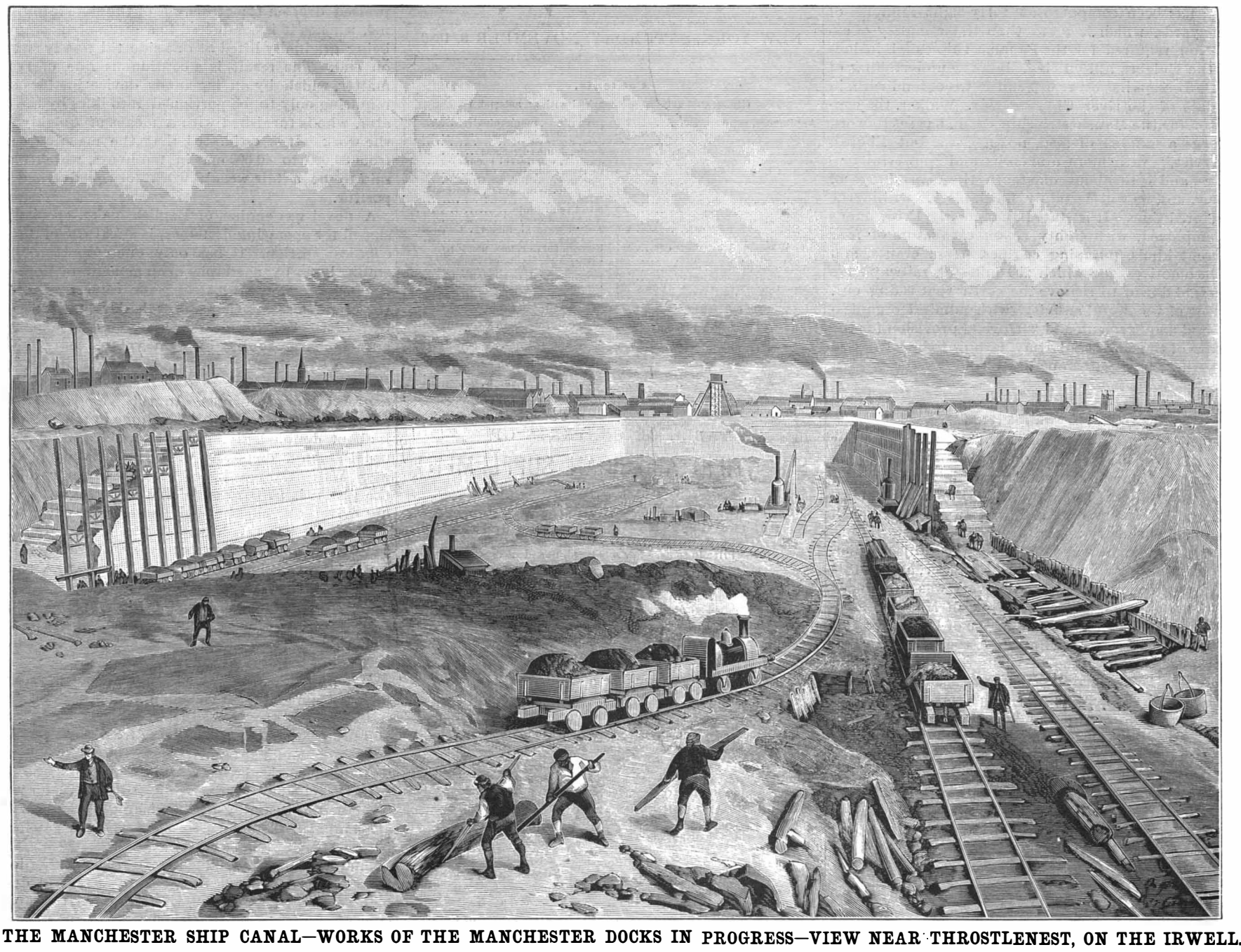
Five sets of locks—at Eastham, on the Mersey sea estuary, at Latchford, on the Mersey, above Warrington, at Irlam above the junction of the river Irwell with the Mersey, at Barton on the Irwell, and at Manchester—raise the level of the canal, on the whole, 60 feet above the sea. Of its entire length, twenty-three miles inland from Runcorn to Manchester will have been formed by cutting a straight and deep channel for the rivers Mersey and Irwell. The lower section, from Eastham to Runcorn, forms a curved line of twelve miles along the Cheshire shore of the broad inner expanse of the Mersey estuary, but at Weston Point meeting the estuary of the navigable river Weaver, which is connected with an extensive system of canals, it will obtain valuable local traffic, especially the shipment of salt. A large trade with Cheshire and the Staffordshire potteries, by the Bridgewater canal, will also reach the ship canal at Runcorn, as well as that of the chemical manufacturers at Widnes. The Shropshire Union canals will feed the traffic at Ellesmere Port, near Eastham.

The Manchester docks formed on both banks of the Irwell, chiefly in Salford, but also in Manchester on the site of the Pomona Gardens, Cornbrook, and extending to Throstlenest and the Albert Bridge, near the old Trafford Road, will afford ample accommodation to the trade of that city. They occupy a space of two hundred acres. The water area of the dock basins is sixty-two acres and a half, and the quay frontages are three miles and a half in aggregate length, to which may be added a mile of open wharves along the wide part of the canal just below, and there will be two miles and a half of the canal bank, lower down, available for discharging cargoes into barges and lighters, and putting them ashore. Fifty hydraulic cranes, some of great power, will be provided at the Manchester and Salford docks.

The docks at Warrington, twenty-two acres and a half in extent, are not yet constructed. They will have a railroad connection with the London and Northwestern and the Great Western Railway, which will bring a large coal and general traffic.

At Runcorn, at the head of the Mersey estuary, the docks belonging to the Bridgewater Canal navigation, having been purchased by the Manchester ship canal, will always be accessible, instead of being entered only at spring tides as hitherto. The local trade advantages here as well as those of the docks at Weston Point, for the Weaver navigation, have already been noticed.

The ship canal will be entered from the sea, or rather from the Mersey estuary, about four miles above Birkenhead, by the tidal locks at Eastham, all the gates of which will be open at high tides. The sills of these entrances will be 11 feet lower than the deepest dock sills at Liverpool or Birkenhead, and the channel approaching them will be dredged 3 feet deeper than the lock sills.



THE MANCHESTER SHIP CANAL—WORKS OF THE MANCHESTER DOCKS IN PROGRESS—VIEW NEAR THROSTLENEST, ON THE IRWELL.

Such will be the Manchester ship canal, omitting for the present a detailed description of the docks at Manchester and Salford. The engineer, Mr. Leader Williams, C.E., and Mr. T. A. Walker, the contractor, have been wonderfully successful in their operations, and there is no doubt of the work being finished before the end of the year 1891, having been commenced in November, 1887. The contract was taken by Mr. Walker for £5,750,000 ($28,750,000), but we may expect this sum to be considerably exceeded by the total cost of the ship canal, for the purchase of the Bridgewater canal property has cost £1,750,000. One of the great causes of expense has been the erection or reconstruction of railway bridges crossing the canal, each at a high elevation, to give a clear headway of 75 feet above the water, and with the approach lines of railway to rise by moderate gradients on each side. The Cheshire Lines railway at Irlam, the Wigan Junction line, the Warrington and Stockport line, the Grand Junction line at Warrington, and the London and Northwestern Railway at Runcorn, must be treated with such

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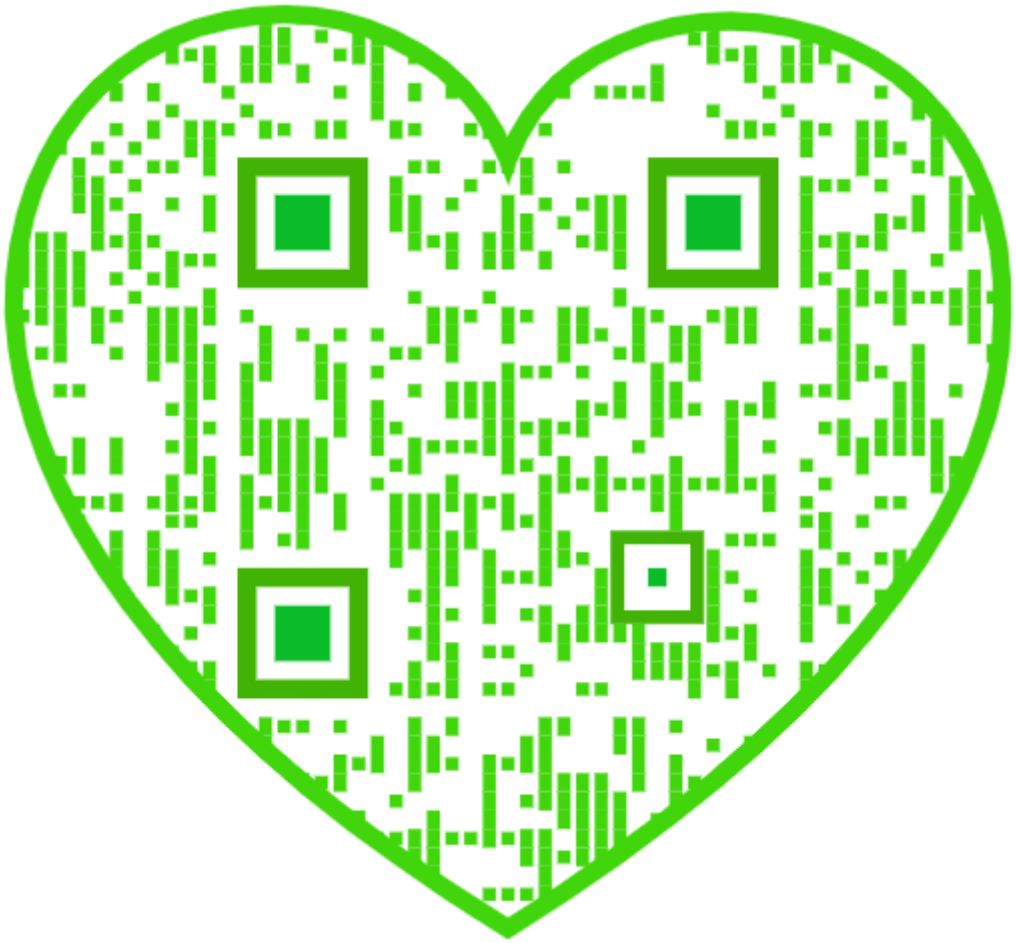

costly alterations. The Barton aqueduct of the Bridgewater canal across the Mersey is replaced by an opening swing bridge, which is an iron trough, to be closed at each end when the bridge is to be opened, and to contain the water of the Bridgewater canal, held thus safely above the level of the ship canal. There will be hydraulic lifts by which laden barges can easily be transferred from the one canal to the other. The locks on the ship canal are not single, but each set of locks has receptacles of different sizes for vessels of different classes, to avoid the waste of water in using a lock much larger than the size of the vessel requires. The canal level descends 16 feet at the Trafford locks, near Manchester, 14 feet at the Barton locks, 14 feet at the Irlam locks, again at Latchford, 16 feet more, and finally at Eastham, to the level of the sea. The largest lock at Eastham is 600 feet long and 80 feet wide.

The line of the canal is cut through flat country, marsh meadows chiefly, pretty straight beyond the junction of the Irwell and Mersey, avoiding the many windings of those rivers, which are generally turned into a new artificial channel, somewhat to the south of the old left bank of each river. In a few places only, on the Mersey, where the ground is higher, the cuttings are 50 feet deep, and partly through sandstone, which has been utilized for the construction of walls, and here the sides of the canal, being of rock, are made more perpendicular than in the softer ground. The whole quantity of earth and stone to be excavated has been computed at forty-eight millions of cubic yards, which is more than the quantity of excavation required for the Panama ship canal, including the Culebra hill cutting, but the undertaking of M. De Lesseps has other difficulties to contend with, in the dam of the river Chagres. Mr. Walker, the contractor for the Manchester ship canal, has set to work as large a number of men, not negroes, but English "navvies," with more numerous and powerful machines, and with about one-tenth the expenditure of money, and he will certainly finish his job within the appointed time. It is stated that nearly 15,000 hands are employed, with eighty steam excavators of four different kinds, pumping engines, steam cranes, and 150 locomotives, for which 200 miles of railway have been laid down, to remove the earth that is dug out. A scene of wonderful activity, with admiral organization and management, and with good provision for the welfare of the industrial army, is now to be witnessed everywhere between Manchester and Eastham.—*The Illustrated London News.*

Dr. Joule, F.R.S.

James Prescott Joule, LL.D., D.C.L., the discoverer of the law of the mechanical equivalent of heat, died at Sale, near Manchester, on Friday night, October 11, after many years of feeble health. Dr. Joule was born at Salford, December 24, 1818, and in his early youth he studied chemistry under the great chemist Dalton. In 1841 and 1842 he was working at the subject which is so indissolubly associated with his name, and in 1843 the earliest form of his great discovery was announced in a paper on "The Calorific Effects of Magneto-Electricity, and on the Mechanical Value of Heat," read at the Cork meeting of the British Association. In 1850 he received the Royal medal of the Royal Society, and in 1870 the Copley medal of the same society. He was the author of a large number of papers published in journals and transactions, and a complete collection of these papers has been published by the Physical Society. In 1880 the Society of Arts awarded the Albert medal to Dr. Joule "for having established, after most laborious research, the true relation between heat, electricity, and mechanical work, thus affording to the engineer a sure guide in the application of science and industrial pursuits."

The International Maritime Exhibition.

On November 4, in Mechanics' Building, Boston, Mass., the above-named exhibition will open. It will remain open until January 4, 1890. It will include everything relating to shipping, from a needle to an anchor. The exhibits will cover so extensive a field that we have not room for their mere enumeration. They are classified in fifteen divisions, including models, machinery, armament, rigging, life-saving systems, etc.

A facsimile of the Burgess schooner Quickstep is to be one of the most striking features of the grand hall. Due recognition of the exhibition has been taken by the Federal authorities, who will do their part in contributing exhibits and facilitating matters generally. The Smithsonian Institution will send on a very interesting collection of boat models and other objects from their museum.

It is hoped that a naval parade will be held on the opening day, and that the vessels of the North Atlantic squadron will participate. It is evident that the exhibition will be of the highest interest, and we hope it will be the beginning of a series of special exhibitions such as have proved so successful in London.

A journal of the fair called the *Kedge Anchor* is being issued, which gives items of interest *apropos* of its impending opening.

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THE AMERICAN INSTITUTE FAIR.

Whoever would see the machinist and the artisan plying their craft, or cares to study the progress of manufacture and invention, should not miss the American Institute Fair. There the loom and spindle are at work, the turner fashioning his wares from rough-hewn timber, the iron worker and brass finisher plying the lathe and burnisher, the quarryman at the lever of the rock crusher, the dynamos generating electricity, and many other cunning mechanisms speeding away as though there was not a moment to spare, with the 250 horse power steam engine, from which they get their energy, twirling its ponderous wheels with no show of haste, no jar of the imprisoned forces, only a thoughtful humming.

A fountain twenty-five feet high bursts from a mass of living ferns, dwarf palmetto, and water grasses and other growths in many shades of green, Fresh water confervas cling to the rocks on which the falling waters splash, and bunches of colored incandescence lamps, lily-shaped, spring from a circle of vases, turning the limpid spray that falls upon them into a jeweled shower.

A type setting and distributing machine, worked by steam, is an interesting exhibit. Its main feature is a vertical revolving cylinder with a series of long slots from top to bottom, each filled with types of a single letter or mark or quad. The operator sits before a keyboard in which each letter and mark of the several founts is shown. Each is a delicate lever, which when pressed drops a type from one of the slots into a channel, whence it is conducted to a screw-shaped groove, being gradually lifted at one side till finally standing on end. The result is a continuous line of reading matter, which by an ingenious device justifies itself; requiring only to be portioned into lines by the operator, who is furnished with a means of quickly doing the work. It is estimated that the machine can set from 36,000 to 40,000 ems in ten hours, which may be said to be a fair week's work for the average compositor.

A novel gas engine, of English make, specially designed for operating dynamos, is a feature of the mechanical section. It has only one cylinder and one crank, but, by a simple arrangement of link-work, the piston makes *four* strokes for each revolution of the crank-shaft, so that power is developed at every turn of the fly-wheel. Other gas engines expand the ignited charge to the original volume only; the exhaust valves being opened when there is yet some forty pounds pressure in the cylinder, thus calling for a greater supply of gas. In this gas engine the expansion continues until the volume of ignited charge is about doubled, giving, so it would appear, an unusual amount of power with the ordinary charge of gas. When the crank has completed its revolution, the piston is at the end of the exhaust stroke, having driven out the burned gases from the previous working stroke; this in some types of gas engines being considered so important as to warrant the sacrifice of a whole revolution to attain. The engine runs at high or low speed equally well.

The manufacture of cotton seed oil and lard and soap is exhibited in its various stages; first the seeds, then the shelling process, the crude product, and the product of the various stages of refining.

A respirator exhibited looks like a large cup with false bottom held over the mouth and nose by a band passed around the head. It is claimed for it that it will protect the throat and lungs from dust, poisonous gases, etc., and is intended for use by miners or workmen in white lead corroding works, glass and blast furnaces, chemical, pulverizing, paint and color works, dry crusting, grinding and polishing works, etc. The air is inhaled through a thin wet sponge, passing out through an automatic valve.

The Persian art enameling on glass (so called) is shown on an extensive scale; many beautiful designs being exhibited. The colors used have the appearance of fine sand, but, after firing, the particles are fused and a smooth, highly polished surface results, a surface so hard that—so the proprietors claim—it can be marked or scratched only by a diamond. The colors are transparent, and show equally well in reverse, though laid upon one side only. It is claimed that greater delicacy of design and elaboration of detail are attainable in this enameling than is possible in stained glass work; the unsightly "joins," too, being dispensed with. There is work in faience with delicately wrought flowers in delightfully natural tints and figures of striking naturalness; these in translucent or opaque enamels.

A new screw machine for bench work is designed for very small, quick work, requiring a light, sensitive machine. The turret slide has adjustable stop, and the block can be bound anywhere along the bed. The cut-off slide has two tool posts, with adjustable stop for each. All kinds of small shoulder screws, handles, knobs, washers, collars, pins, etc., can be turned out with rapidity, accuracy, and finish. The wire chuck which acts with the machine in motion is worked by the handle at the end of the head. One stroke of the lever releases the grip of the chuck and allows the

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wire to pass in through the hollow spindle, while the return stroke tightens the chuck and binds the wire.

A new liquid meter is especially convenient for selling oils, turpentine, etc. A portable house, that can be readily carried into the woods, will interest sportsmen. Other interesting inventions are a new damper regulator, a self-cooling furnace door, improved granite roofing, a free-cutting and even-tempered emery wheel.

Chinese Floating Gardens.

The following description of the manner in which floating fields and gardens are formed in China was condensed for publication in *The Garden* from an article by Dr. Macgowan, which originally appeared in the *China Review:* "In the month of April, a bamboo raft, ten to twelve feet long and about half as broad, is prepared. The poles are lashed together with interstices of an inch between each. Over this a layer of straw an inch thick is spread, and then a coating two inches thick of adhesive mud taken from the bottom of a canal or pond, which receives the seed. The raft is moored to the bank in still water, and requires no further attention. The straw soon gives way and the soil also, the roots drawing support from the water alone. In about twenty days the raft becomes covered with the creeper (*Ipomœa reptans*), and its stems and roots are gathered for cooking. In autumn its small, white petals and yellow stamens, nestling among the round leaves, present a very pretty appearance. In some places marshy land is profitably cultivated in this manner. Besides these floating vegetable gardens there are also floating rice fields. Upon rafts constructed as above weeds and adherent mud were placed as a flooring, and when the rice shoots were ready for transplanting they were placed in the floating soil, which being adhesive and held in place by weed roots, the plants were maintained in position throughout the season. The rice thus planted ripened in from sixty to seventy, in place of 100 days. The rafts are cabled to the shore, floating on lakes, pools, or sluggish streams. These floating fields served to avert famines, whether by drought or flood. When other fields were submerged and their crops rotten, these floated and flourished; and when a drought prevailed they subsided with the falling water, and while the soil around was arid, advanced to maturity. Agricultural treatises contain plates representing rows of extensive rice fields moored to sturdy trees on the banks of rivers or lakes which existed formerly in the lacustrine regions of the Lower Yangtsze and Yellow Rivers."

The Brain Weight of Man and Woman.

The subject of the comparative weight of the brain of man and woman comes up periodically, and almost always some incorrectness of statement or inadequacy of knowledge is to be observed. Perhaps a certain feeling of gallantry tempts speakers and writers to handle tenderly facts apparently in conflict with the view that woman is encephalo-morphologically the equal of man.

The average weight of the male brain is 49 1-2 ounces, of the female, 44 ounces—a difference of over five ounces. Woman's brain has a higher specific gravity. The man has a larger brain in proportion to stature (Marshall), but woman's brain is larger in proportion to her weight. In 239 Russian brains (Buchstab) the ratio of body weight to brain weight was for the male as 38 to 1, for the female 35 to 1. In woman the brain is shorter in the sagittal diameter, being from 6 2-5 to 6 3-5 inches in man, 6 to 6 2-5 inches in woman (Huschka). The transverse and vertical diameters are more nearly equal in the two sexes.

The frontal lobe is better developed in man, the distance from the anterior extremity of this lobe to the upper end of the fissure of Rolando being in males 152 9 mm., in females 140·6 mm. (Buchstab). On the other hand, the occipital lobe is more developed proportionately in woman, the distance from the point of the occipital lobe to the parieto-occipital fissure being in males 48·7 mm., in females 51·4 mm. This is for Russian brains, which are a little smaller than German and English, a little heavier than Italian and French brains.

The difference between the weight of brain in man and woman increases with civilization, and is most marked in the Caucasian races. In Parisians this difference amounts to 222 grammes, or nearly seven ounces; in European nations generally, 163 grammes; in Hindoos, 120 grammes; in Australians, 103; in negroes, 82; in Chinese, 15.

The greatest sexual difference as regards brain weight is found at birth, when the female brain weighs 347 grammes, and the male 393, or about $\frac{1}{8}$ more, while the total weight of the male infant is about $\frac{1}{15}$ more than that of the female. The female brain begins to lose weight after the age of thirty, that of a man not till ten or fifteen years later. The loss in woman is very slight, however, and she keeps up a high brain weight much later (till seventy) than man, so that in old age the difference in brain weight is reduced to its minimum, or a little over three ounces.

Definite statements cannot be made regarding the sexual differences in convolutional complexity, or the thickness of the gray matter, two important points in estimating the intellectual powers of the organ.

Despite much loose talk regarding the unimportance of brain weight as a test of intellectual superiority, it is unquestionably an important factor. What Thurnam calls medium brains range in weight between 40 and 52½ ounces for men and 35 and 47½ ounces for women. All brains in size above this are called megalocephalous. Now, the tables of brain weights collected by Bastian and others show that the proportion of great men who are decidedly megalocephalous is twenty-five per cent while the proportion in average men is four per cent to five per cent. The proportion of incipient megalocephaly (*i. e.*, weight above 52½ ounces) among eminent men is nearly sixty per cent. There can be no doubt that the majority of eminent men have large brains, just as the majority of ordinary men have forty-nine ounce brains. Certain individual cases furnish exceptions, and distinguished talent can coexist with a small brain, but it is not the rule.

When a brain falls to a weight of 37½ ounces in a man, or 32½ ounces in a woman, it is called microcephalic, and the rule is that below these limits idiocy exists. There is just five ounces less amount of brain matter, however, needed to keep a woman from idiocy than is needed for a man. Hence we may reasonably suppose that this, which is nearly the average difference in brain weight of the sexes, represents, not tissue necessary for mentality, but corresponds with the smaller muscular mass and shorter stature of woman. —*Medical Record.*

International Association of Educators.

The *Lancet* reports an international congress recently held in Paris to promote the cause of free education, education free from dogma, from excessive official control, and absolutely integral. By this very useful French word the idea of completeness is conveyed. It means that everything is to be taught if the pupil is capable of learning. From the public health point of view the doctrines enunciated by this congress were important. M. Desmoulin, till quite recently Municipal Councilor of Paris, was in the chair at most of the sittings, but after the opening meeting held at the Hotel de Ville the congress, out of compliment to the foreign nationalities represented, elected Mr. Adolphe Smith (for England) as president and Madame Polousky (for Russia) as vice-president. There were a great many Russian and Polish teachers present, and delegates from Belgium, Italy, Mexico, the United States, and Switzerland. The greater number were teachers, but I noted also a few medical men, and the women delegates were nearly as numerous as the men. So far as the debates bore on questions connected with public health, the following were the principal points elucidated. First, teaching was to be based exclusively on scientific principles, deductions from actual experiments. Instead of being told, the child was to be made to discover, if possible, that which it is desired to teach. Every natural proclivity was to be encouraged. A child should never be forced in any direction, and should never be overworked. The classes were to follow each other in such a manner as to provide the greatest possible change, and thus prevent weariness. But, above all, the children were to be fed, and well fed. The delegates were unanimous in denouncing the hardship endured by underfed children, and the impossibility of teaching under such conditions. The Swiss delegate declared that in primary schools of several cantons not only were free meals provided, but even articles of clothing were given away, so that the children of the poor should not suffer from cold while at their lessons.

For the preservation of the morality of children the congress was strongly in favor of mixed schools. Just as brothers and sisters were brought up together in the family, so ought boys and girls to work together at school, and they should have both masters and mistresses. Each sex had its special capacities, and the children should profit by both. There was far more decency when the sexes were together. Sometimes a master married one of the schoolmistresses, sometimes even among the children playmates later in life became husband and wife, but there was not that immorality which prevails to so large an extent in both boys' and girls' schools or convents where the sexes are separated. The experience of mixed schools in Switzerland and in Germany helped to confirm, the delegates maintained, these theories. Also there was far more emulation when the sexes were mixed.

Mr. Adolphe Smith introduced a resolution demanding that, "In view of preserving public health, it should be obligatory to teach in all schools and to both sexes the elementary laws of hygiene, including the principles of drainage, ventilation, and disinfection." He explained how the mortality in different centers of population in England had been reduced by one-third in consequence of the application of sanitary laws. But it was necessary that each person should be sufficiently acquainted with these laws to apply them in his own home and to vote for the election of such municipal councilmen, vestrymen, and members of Parliament as would promote wise legislation on the subject. For all these reasons it was necessary to teach the good doctrine early, and no better lesson could be given than the object lesson of a school properly built and free from all sanitary defect. In this respect it was fortunate that the congress was international, for the congress would have a great deal to learn from English schools so far as the drainage was concerned, but the English had much to learn from France with respect to the unilateral light and to the ventilation and warming of school rooms, which was more scientifically arranged in France. The Swiss delegate, in supporting the resolution, insisted forcibly on the necessity of building schools in accordance with sanitary laws, as the masters would be placed in an absurd position if they taught pupils principles of hygiene which were not applied in the *locale* where the lessons are given. A Polish delegate protested that, while most persons talked of hygiene, very few persons knew anything at all about the question. It was time that the science was properly and systematically taught. The congress then unanimously voted in favor of the resolution.

A considerable sensation was produced by Madame Cheliga-Loevy's report on the condition of education in Poland. Everything was done to prevent the free development of thought. The government wanted doctors and engineers, but, on the other hand, looked on education as a danger, as a power that menaced social order. Hence the universities and the upper schools were checked in their development by all manner of prohibitory decrees. In one province, possessing 7,000,000 inhabitants, there were only twenty schools for secondary education. The children of poor parents were by law excluded from the universities, and only those who were very rich and considered favorable to the government were admitted. The want of doctors, engineers, and educated men in Russia would soon assume the proportions of a national calamity. Madame Corradi, a Russian delegate, described the torture of children set to uninteresting tasks of Latin and Greek, taught like parrots, not allowed to think, and so uselessly and stupidly overworked that suicide among school children had become quite epidemic in Russia.

The congress at its last sitting decided to constitute itself into an International Association of Educators, and M. Francolin, 174 Faubourg St. Denis, was elected international secretary. The association will seek to promote in every country the cause of free and scientific education.

Extralite—Experiments with the New Explosive.

On October 24, in the Croton aqueduct excavations in Central Park, some experiments were performed with extralite. Rudolf Ericsson, the holder of the patent, conducted the operations, which were designed to show the safety of the composition and its effectiveness as a blasting agent. Extralite is a yellowish powder, a mechanical mixture of several constituents, including nitrate of ammonia and naphthalene. The powder used in the experiments was made by the inventor in his own house without any special appliances. A fire was lighted and a quantity of the powder was burned in it; some was poured upon a hot plate of iron and quietly burned. It was hammered between stones, and a pistol ball was fired through a can filled with it, without effect in either case. A detonating cap was exploded when embedded in a cartridge of extralite, also without effect. Finally three holes in the rock were charged and tamped, and fired by detonators. Owing to the confinement in the bore holes, the extralite detonated with immense power, throwing pieces of the rock to a great distance and upheaving a very large mass of material. The explosive in general terms was shown to be one that can only explode when confined, and then possesses immense power. Its adaptation for blasting and for charging percussion shells was apparently very well illustrated.

The Great Cairo Bridge Opened.

The Illinois Central opened its $2,500,000 bridge across the Ohio river at Cario on the 29th ult. President Fish, Vice-President Harrison, and other officials of the Illinois Central were present at the opening. The bridge proper is 2 miles long, and the approaches 4 miles long. The bridge is 58 feet above high water, and 110 feet above low water. The piers are in pneumatic caissons, and are sunk 50 feet below the bed of the river. An engineering feat was here successfully attempted which reads like a fairy tale. At this depth below the river bed no foundation was reached, and it was impossible to sink the piers further. They were consequently packed with sand, and the immense bridge is really sustained by the friction of the sand on the sides of the piers. The bridge was tested with nine Mogul engines, and was pronounced perfectly satisfactory. It was built by the Union Bridge Company, of Buffalo. The engineers for the Illinois Central are George S. Morison and E. L. Corthell.

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AN EXTINCT BIRD (FREGILUPUS VARIUS BODDAERT).

The organisms that people the earth, like everything in the world, are subject to continual change. The individual grows up, remains for a time in full possession of its powers, then becomes old and weak, and dies. It is the same with the species—they also have their youth, prime, and old age.

The bodies of many thousand species of animals lie buried in the strata of the earth, species which were once widely spread on the surface of the earth, but died out very long ago, leaving no descendants. And the same that occurred formerly is still going on. Even within historic times a whole series of animals have become extinct, and it seems that the days of not a few others are numbered. Even in our own century the great auk inhabited the coasts and islands of the North Atlantic, but because he could not fly and thus escape the pursuit of man, he was stricken out of the book of life.

The sea cow, a phytophagous inhabitant of the sea, which was found off the coast of Kamtchatka and the islands of the Behring Straits, has been completely exterminated during the last twenty-five years. Different kinds of struthious birds lived, formerly, on both islands of New Zealand; they were undisputed lords of the land, which harbored no four-footed beasts of prey, and did not need wings.

Then man appeared on the scene, and with one blow changed everything. Against him the feathered giant could not hold its own, and the race has long been extinct. It was the same with large birds on other islands; one species on the island of Rodriguez died out after the introduction of swine, which ate their eggs, they having been simply deposited on the ground.

On these islands not only the birds which could not fly were exterminated, but also many which had the power of flight. Five or six kinds of parrots lived there when the place was first visited by Europeans, but now they have disappeared; and it is the same with the bird represented in our cut, Fregilupus varius, which was described by Flacourt as early as 1658, under the name of Tiuouch, but since 1858 no living specimens have been seen. We do not know the history of its extinction, but are sure man had a hand in it.

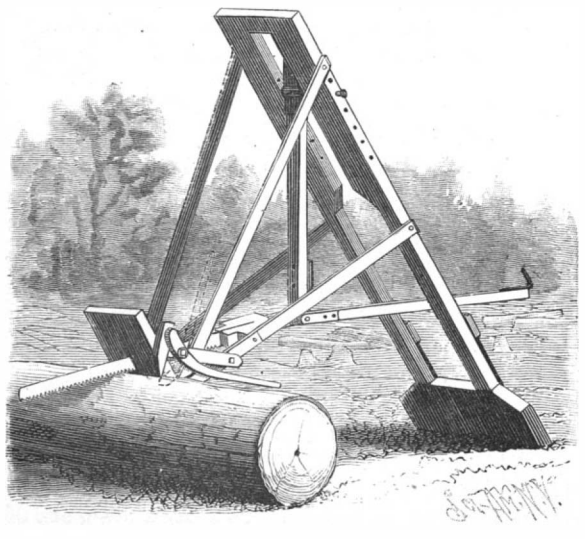
AN EXTINCT BIRD (FREGILUPUS VARIUS BODDAERT).

The bird is about nine inches long, its color is white and bister, with rust red on the back and tail, the beak is long and curved, the wings and tail moderately long, and the head is decorated by a hood of upright white feathers.

Principally on account of this hood the bird has been classed with the hoopoes, but according to Murie it should be classed with the starlings. Our cut is an exact representation of the stuffed specimen in the Kensington Museum.—*Illustrirte Zeitung.*

AN IMPROVED DRAG SAW.

A drag saw designed to be conveniently manipulated by one person is illustrated herewith, and has been patented by Mr. Richard Y. Macbeth and Mr. Louis Gourdin, of Monk's Corner, S. C. A frame is employed in which spaced parallel beams extend forward and downward from near the top of the rear standard, a second set of intermediate brace bars extending forward at right angles to the standard, and where the front ends of these bars meet a head block is secured, with a vertical guide slot adapted to receive the saw blade. The saw has at its inner end a shank to which a weight is attached on each side of the blade, and the rear end of the shank is pivoted to the lower end of a pendulum rod adjustably journaled in the upper portion of the standard whereby the saw may be raised or lowered. A weight is also attached to the pendulum rod near the saw. The saw is reciprocated by means of a handle pivoted at the rear of the blade shank, and extended rearward through the standard. Upon the base of the standard are pins adapted to be driven into the ground to hold the frame in position, and near the outer end of one of the brace bars is pivoted a dog to be driven into the log, the dog being released from the log by raising to a vertical position, as shown in dotted lines in the illustration, a curved releasing lever pivoted upon the dog.



MACBETH AND GOURDIN'S DRAG SAW.

One of Herschel's Problems.

In her "Reminiscences of the Herschels," in the *Century Magazine*, the late Prof. Maria Mitchell says: "One of Sir John Herschel's numerical problems was this: If, at the time of Cheops, or three thousand years ago, one pair of human beings had lived, and war, pestilence, and famine had not existed, and only natural death came to man, and this pair had doubled once in thirty years, and their children had doubled, and so on, how large would the population of the world be at this time—could they stand upon the earth as a plane?

"We were sitting at the breakfast table when he asked the question. We thought they could not. 'But if they stood closely and others stood on their shoulders, man, woman, and child, how many layers would there be?' I said, 'Perhaps three.' 'How many feet of men?' he asked. 'Possibly thirty,' I said. 'Oh, more!' 'Well, we'll say a hundred.' 'Oh, more!' Miss Herschel said, 'Enough to reach the moon.' 'To the sun.' 'More, more!' cried Sir John, exulting in our astonishment; 'bid higher.' 'To Neptune,' said one. 'Now you burn,' he replied. '*Take a hundred times the distance of Neptune, and it is very near.* That is my way,' said he, 'of whitewashing war, pestilence, and famine.'"

Fermentation of Ensilage.

Prof. Burrill read a paper before the American Association on fermentation of ensilage. He stated that all fermentation of organic matter is now universally admitted to be due to the action of micro-organisms, and he described the phenomena presented in recently stored green fodder, used for cattle food. This material is now placed in bins of large size, where it soon becomes very hot, reaching a temperature of 60° C. (140° F.). This temperature was sufficiently high to kill, or at least prevent the growth of, nearly all animal and vegetable species, 50° C. being the upper limit. Upon proper examination of this hot material one soon finds that a single species of bacteria (*Bacillus butyricum*) is associated with the fermentation and subsequent rise in temperature. Further tests prove that it is the cause of these changes. Secondary changes are very liable to occur as the heat decreases, and lactic and acetic acid, the latter often in large amounts, are produced. Possibly alcohol is sometimes, but never as a first product of the hot material.

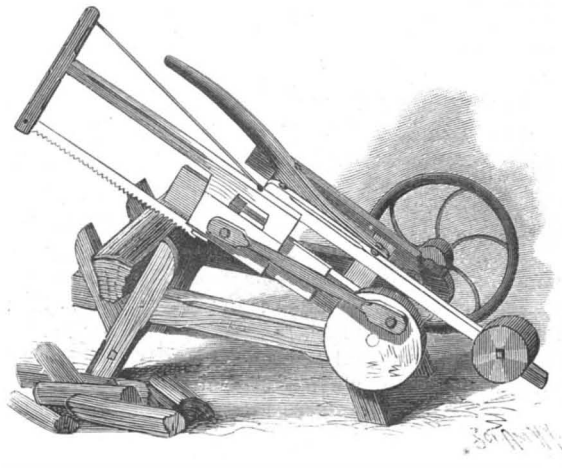
The London Bread Trust.

The issue consists of 100,000 shares of £5 each, for the purpose of acquiring 277 old established London bakery businesses, a freehold bakery, and three steam flour mills. The directors are men of good standing, who are stated to be all practically acquainted with the business. Considered merely as a moderately speculative investment, the prospectus was extremely attractive. Its proposal to earn profits to the amount of £91,000 on its capital of half a million is sanguine enough, and perhaps not too sanguine. Yet the proposal involves very serious consequences. During the past forty years, at least, we have been accustomed, as a nation, to look upon competition as the life and soul of trade; and here, as the result, probably, of unrestricted competition, monopoly steps in and quietly occupies the leading positions. The salt trade, the starch trade, the match trade, the thread trade, as well as others, and now the trade in the "staff of life" is made subject to what appears to be an increasing tendency—the tendency toward monopoly. There could be no more serious weapon in the hands of any body of men than monopoly in bread. The hold that such a board of directors might have over the food supply of London is a power capable of being wielded dangerously.

Without questioning for a moment the benevolence of the directors in this particular case, it is quite legitimate to speculate upon the possibility of this control being used by the directors as an engine to maneuver prices or to determine wages by questionably legitimate means. The recent strike of the dockers caused immense inconvenience to everybody in business in London; but what should be said of a dispute between the Bread Union and its employes, and the possible contingency of the directors refusing to submit the matter to arbitration? There have been bakers' strikes before, but they have generally been limited in their area, and have not involved serious disturbance. But the homogeneity of capital on one side would of necessity compel homogeneity of labor on the other, and thus a strike of bakers simultaneously in three hundred bakeries in London might reduce the city to measurable distance of famine.—*Industries.*

AN IMPROVED SAWING MACHINE.

The accompanying illustration represents a portable crosscut sawing machine, patented by Mr. John De Graff, in which the saw is reciprocated in a horizontal or slightly inclined plane by means of a crank shaft operated by hand or power. At one end of the main frame of the machine is a buck on which the wood to be sawed is placed, and at the other end of the frame is a shaft carrying a balance wheel, a crank wheel, and a pulley, through which the machine may be run by power. Upon the shaft is mounted a frame, normally upheld by a counterbalancing weight supported by a rearwardly extending arm rigidly connected to the frame, and to one side of the frame is secured a metallic plate serving as a way for a saw frame, the latter frame having recessed brackets to receive the edges of the plate. The saw frame is connected to a pitman, the other end of which is connected to a wrist pin carried by the crank wheel. The frame carrying the plate which serves as a way for the saw frame can be readily raised and lowered by a forwardly extending handle, the saw being held to its work by pressing down on the handle, the frame being raised, or allowed to rise, after each stick is sawed through.



DE GRAFF'S SAWING MACHINE.

For further information relative to this invention address Mr. F. H. Page, Key, Iowa.

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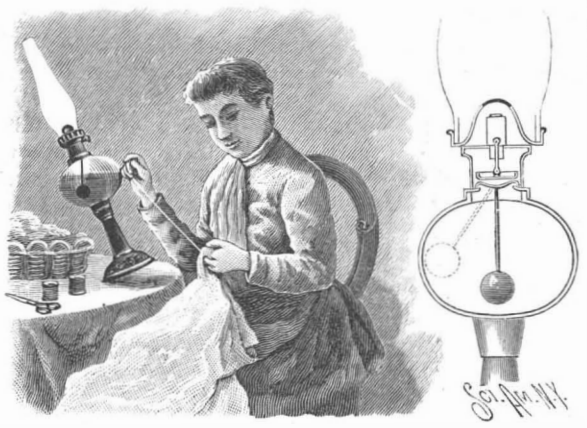
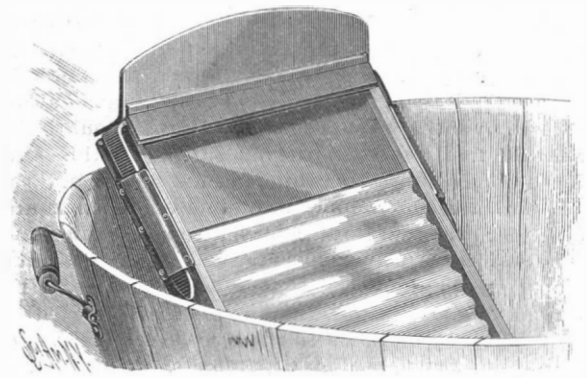
AN AUTOMATIC LAMP EXTINGUISHER.

A device which may be attached to any lamp, and with which, should the lamp be overturned or thrown much out of perpendicular, the flame will be automatically extinguished, is illustrated herewith, and has



MILLER'S LAMP EXTINGUISHER.

been patented by Mr. Joseph Miller, of Olean, N. Y. The collar by which the burner is attached to the lamp body is carried inward and upward to form a flange, upon which is made to rest a dish-shaped disk, with a flanged periphery overlapping the flange upon the collar. A pendulum weight is rigidly secured to the bottom of the disk, and above this disk is a second disk, normally sustained by the first one, the upper disk being connected by a rod with a sleeve that is vertically movable upon the wick tube. In operation, the tilting of the lamp causes the pendulum to swing to one side, as shown in dotted lines in the sectional view. The lower disk, to which the pendulum is rigidly attached, is thus thrown upward, one of the flanged edges of the disk pivoting upon the flange on the collar, and by the contacting of the lower disk upon the upper one the rod connecting the latter with the sleeve upon the wick tube is moved upward, carrying the sleeve over

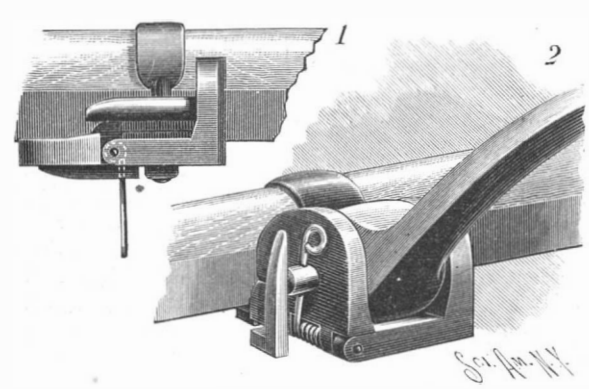


STONE'S WASHBOARD PROTECTOR.

the end of the wick tube and extinguishing the flame. Another form of construction is provided, in which the pendulum disk is arranged in the lamp pedestal, the connecting rod extending up through a central tube in the lamp body to the sleeve upon the wick tube, and the principle of the invention is likewise applicable to other forms of lamps or other lights, to be extinguished by being thrown out of the perpendicular or tipping to a certain angle. When the device is used with lamps on a railroad train, a similar automatic extinguishing of the lamp is designed to be effected by the very sudden stoppage of the cars, as in case of collision, the shock then throwing the pendulum to one side.

AN IMPROVED THILL COUPLING.

A coupling by means of which the thills may be quickly and conveniently attached to the axle, the coupling being such as may be secured to any axle without difficulty and used with any of the ordinary forms of thills, is illustrated herewith, and has been patented by Mr. Thomas L. Barr, of Plymouth, Ohio.



BARR'S THILL COUPLING.

Fig. 1 shows the coupling in position to receive the thill, Fig. 2 showing it holding the thill in place. The base plate of the coupling has at one side an upwardly extending fixed ear, from which projects a pin with beveled and notched end, adapted to engage the thill iron. Upon the other side of the base plate a laterally movable ear is hinged between two lugs, the central lower portion of the ear through which the pintle passes being recessed to receive a spring coiled around the pintle, one end of this spring being carried upward and forward to enter the notch of the pin and hold the movable ear in position against the thill iron when the latter is engaged by the pin. Near the rear edge of the movable ear, upon its outer face, is formed a stop, consisting of a downwardly extending metal bar, bent at a right angle rearward to form an arm limiting the downward movement of the hinged ear. In attaching a thill, with this coupling, the thill iron is slipped over the pin projecting from the fixed ear, as shown in Fig. 1, when the hinged ear is carried upward to its vertical position and the arm of the spring brought into engagement with the notch in the outer end of the pin, as shown in Fig. 2. The inner faces of each of the ears at the front lower end are thicker than at the top, and beveled slightly inward, to better fit the thill iron and prevent the thills from rattling.

Peroxide of Hydrogen in Necrosis of the Jaw.

Dr. A. Lohmann, of Cassel, communicates to the *Deutsche Medicinische Wochenschrift* several interesting cases from his dental practice. The first was that of a woman of thirty-two years, suffering from necrosis of the left lower jaw. A sequestrum with both bicuspids was completely separated, and without trouble or pain removed; the posterior portion, which still contained a molar, was freely movable and full of pus. After several injections of peroxide of hydrogen the discharge of pus entirely disappeared, the gum regained a healthy color, and in about a fortnight the patient was quite cured. The second case was that of a civil engineer, twenty-six years old, whose left upper jaw was diseased. After removal of the sequestrum, which contained the last tooth and a bicuspid, peroxide of hydrogen was injected into the diseased alveolar processes at once and several times during the following days, and in a week the patient was completely cured. The author has even cured a case of alveolar pyorrhœa by this method.

AN IMPROVED WASHBOARD PROTECTOR.

The accompanying illustration represents an attachment for washboards designed to prevent the water and suds from being splashed upon the clothes of the person rubbing clothes on the board. The device has been patented by Mr. D. G. Stone, of Negaunee, Mich. The protector is preferably made of metal, and consists of an inclined guard plate or shield having a flat base portion riveted to a supporting strip that extends the full width of the washboard, and is bent down at its ends at right angles to form supporting legs. These legs, when the protector is applied to the washboard, fit in sockets secured on the side pieces of the board, the supporting strip or cross piece, with its attached shield and base piece, lying on top of the ordinary cross top piece of the frame of the board. Where the inclined shield joins the base piece is a downwardly projecting flange extending the full width of the washboard, and serving to close the opening between the upper cross piece of the board and the supporting strip of the protector, preventing any water which may be splashed up from passing out at this place. This protector may be readily detached and reversed to adapt it to opposite sides of the washboard when the latter has double or opposite rubbing faces, and, while of cheap construction, it would outwear and might be used on several successive washboards.

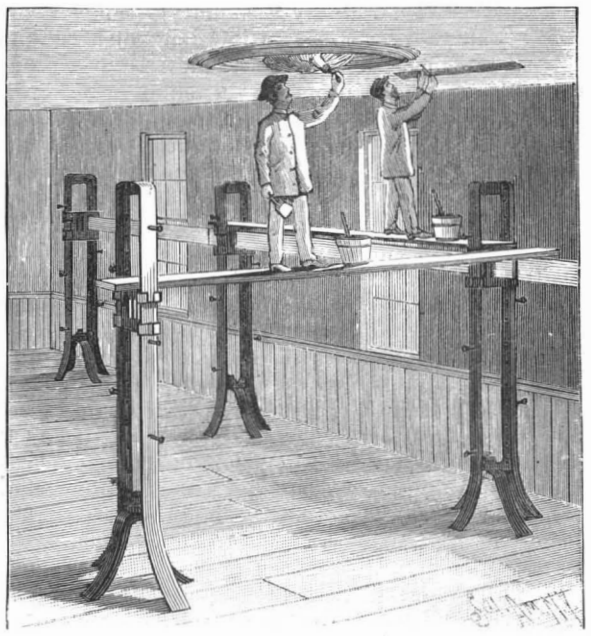
For further information relative to this invention address the inventor as above.

Trade Mark Decision.

The point was recently raised in the Chancery Division of the High Court of Justice (England) whether the word "Monobrut," which had been registered in England as a trade mark for dry champagne, was or was not a valid trade mark. The case came up on an application to have the trade mark removed from the register, the applicant contending that the word was not a "fancy word" within the meaning of the trade marks act. It appeared from the evidence that the word in question was merely a French term for "very dry" wine. Mr. Justice Kay held (*in re* Vigner's trade mark) that under the circumstances it must be regarded as a merely descriptive word, and therefore not entitled to registration as a trade mark according to English law.

AN IMPROVED SCAFFOLD-SUPPORTING STANDARD.

A readily adjustable standard to support scaffold planks at any required height, and allow the building of a scaffold of any desired area, and one which may be folded into comparatively small space when not in use, is illustrated herewith, and has been patented by Mr. Thomas Sixsmith, No. 102 Duane St., New York City. The scaffold standard preferably consists of an open frame made mainly of one piece of T-iron, a scaffold plank-supporting block being fitted for vertical adjustment in the frame. The lower ends of the frame side bars are bent outward to form legs, other legs being pivoted to a tie bar of the frame, and adapted to swing around in line with the sides of the frame, to facilitate transportation or storage. The sides of the frame have projecting pins or bolts, to serve as foot rests for workmen climbing to the scaffold floor. The plank-supporting block has slots at its sides which receive the ribs of the side bars of the frame, and also has pairs of lugs which engage the edges of the side bars. The block may be adjusted higher or lower on the standard and held in position by any suitable detent or latch, and the block

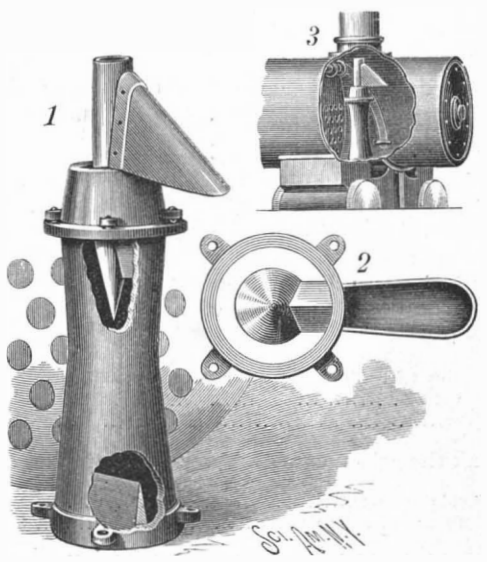


SIXSMITH'S SCAFFOLD STANDARD.

may have top spurs or pins to enter and steady a plank placed on the block. The block is also preferably provided with independent vertical slots or openings, in each of which the end of an ordinary scaffold plank may be sustained edgewise.

AN IMPROVED EXHAUST PIPE FOR LOCOMOTIVES.

An exhaust pipe designed to reduce back pressure in the cylinders, and at the same time increase the draught in the boiler flues, is illustrated herewith, and has been patented by Mr. John S. Bigelow, of Phillipsburg, N. J. Fig. 1 shows the complete device, the exterior walls being partly broken away to show the interior, Fig. 2 is a bottom plan view of the nozzle, and Fig. 3 represents the exhaust in position in the smoke box. The lower end of the main pipe is secured to the bed plate of the locomotive, so that the exhaust from each cylinder passes in near the bottom, where there is held a wedge-shaped partition, forming two subdivisions of the pipe, each receiving the steam from one cylinder. In the upper end of the pipe, where the nozzle is secured, is held a central post, having on one side an offset connecting the post with the inside of the nozzle, and the lower end of the offset is wedge-shaped, in line with the wedge-shaped partition at the bottom of the pipe. The lower end of the post is formed in the shape of an inverted cone, and it has at its upper end, above the nozzle, a bore or recess. The offset is provided with an opening connected with this recess, and



BIGELOW'S EXHAUST PIPE FOR LOCOMOTIVES.

in the opening is held a downwardly inclined hood, opening at the bottom toward the front end of the smoke box. The bottom partition in the main pipe directs the steam upward from each cylinder, preventing reaction of the exhaust from one cylinder upon that of the other, and the cone-shaped lower end of the interior post, with its wedge-shaped offset, is intended to present but little resistance to the steam, the upward movement of which is designed to cause a suction in the recess in the post, and consequently in the hood, so that the smoke from the smoke box is drawn through the hood into the recess, and thence out with the exhaust steam.

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Photographic Reliefs for Decorative or Ornamental Use.

The beautiful modeling of a lead mould, such as is used in printing Woodburytypes, is very suggestive of a variety of decorative uses for the photographic relief; and in the course of a few short articles we propose to give instructions in some methods of making such photographic relief pictures as may serve for ornament or decoration, and it may be mentioned that the methods of making these are very easy—much easier than the making of an ordinary Woodburytype mould.

It is well known that a gelatine film which contains any soluble bichromate becomes so altered by exposure to light as to lose its property of swelling in water. If, then, a film of bichromatized gelatine is exposed under a negative until the darkening produced by the action of light has proceeded so far as to impress every gradation of the picture thereon, a device in various tints of brown on a light yellow ground is obtained, but up to this point the surface of the film remains uniform; that is to say, no part stands out in relief. Let the film—which, by the bye, may either be free or attached to a glass plate for support—be now soaked in cold water. The unexposed parts immediately begin to swell, while those which were freely exposed refuse to swell, and those portions which received an intermediate degree of exposure swell to a proportionate extent. In this way there is formed a most delicately modeled and beautiful relief, which faithfully represents all details and gradations of the original negative. The height of the relief depends on the thickness of the gelatinous film, the degree of exposure, the extent to which the film has been soaked, and other circumstances; but it is easy to obtain a relief of the tenth of an inch in ordinary cases. We can readily reproduce these reliefs in plaster of Paris, metal, India rubber, ebonite, type metal, copper, earthenware, gutta-percha, or even wood; and very numerous applications of the solid pictures thus obtained will suggest themselves to practical men. In supplying such productions, the photographer may give an impetus to the business of the bookbinder, the cabinet maker, the die sinker, the potter, and the embosser of leather or other soft material; besides affording collateral aid to many other industries. The operation of making the gelatine relief being rapid, and its reproduction so simple, it is a wonder this kind of work has not been extensively practiced by photographers.

The method of making the gelatine relief which we shall describe in the first instance is that which we should suggest as the best for general use, and one so easy that any photographic manipulator may hope to make a successful relief after the first trial.

Two pieces of stout plate glass of a convenient size are taken, let us suppose of whole plate size (8½ inches by 6½ inches), and some of the finest "flour emery" or bath brick is mixed with water and placed between them, and the plates are worked over each other until one surface of each is uniformly ground. The plates, now being carefully cleaned, are finally rubbed with soda solution to remove any trace of grease, rinsed, and put on edge to drain.

We now require to set up two leveling stands in the sink of the dark room, and in the event of no regular leveling stands being available, a convenient substitute may be made by blocking up with wedge-shaped pieces of metal, or, indeed, with small coins. A spirit level is not absolutely essential, as, if water is poured on the plates, it will be seen when the upper surface is horizontal.

To prepare the plates for the sensitive mixture, they are now well flooded, ground side uppermost, with a stream of warm water, beginning with moderately warm, and finishing with water at about 70° Centigrade, the gradual heating being necessary to avoid fracture of the plates. Before the hot water has dried off, a quantity of the following sensitive mixture is poured on, so as to drive the water well over the edges of the plates:

Gelatine (Nelson's "Opaque" or "Amber" answers well)	18 parts.
Water	100 "

Soak the gelatine, melt in a water bath, and add—

Liquid ammonia	1 part.
Bichromate of ammonia	3 "

Stir till the bichromate is dissolved, allow the mixture to remain at rest in the water bath till most of the bubbles have risen to the surface, and pour carefully through a piece of muslin (not too fine) stretched over the top of a warmed beaker or jar.

Before leaving the gelatinous mixture to set on the leveled plates, it is important to see that no veins or streams of water remain—a matter which can be insured, if care be taken to allow an even flow from the center to the edges; but any plates where the water may seem to lodge can be readily dealt with by drawing the mixture over with a strip of paper, and, if necessary, pouring on a little more of the gelatinous preparation.

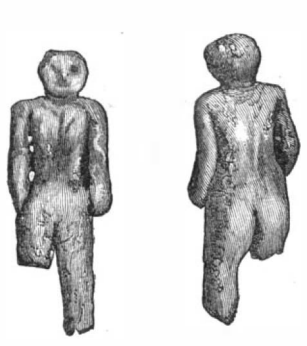
All is now left in position till the gelatine has set, when the plates are put in a warmish place for the films to dry. A gelatine which sets with an uneven or pitted surface—like the "Gold Label" gelatine of Coignet—is unsuitable for our present purpose. As regards the thickness of the film to remain on the plate, it may be mentioned that the colder the plate and the mixture, so much the more will be retained on the glass, and so much thicker will be the film. Before the plates are dry, it is convenient to scrape any gelatine from the backs and wipe them clean, as any lumps may cause fracture in the printing frame. Exposure may be under a negative or a positive, according to the direction in which the relief is to be taken; and it should be continued until the details in the more opaque parts are visible from the back of the plate by the browning of the bichromated gelatine.

The plate is now soaked in cold water until the unexposed parts of the gelatine have swollen sufficiently to give the amount of relief required, and now we proceed to make the plaster cast. A little oil is well dabbed on the face of the relief, and when the excess has been wiped off, strips of wood about an inch high are placed round the plate, and plaster of Paris, mixed with water to the consistency of a thickish cream, is poured into the mould. In order to remove any air bubbles from the face of the relief, a broad camel's hair brush is passed through the liquid plaster and worked to and fro a few times over the gelatine. The plaster being thoroughly set, the border is removed, and the edge of a thin-bladed knife is just introduced along one of the sides between the plate and the plaster. Under these circumstances, a strain will be put upon the plaster cast which will cause it to separate before long from the gelatine. It is well not to hasten the process of separation by the application of any force besides the slight strain set up by the knife blade, but repeated moistening of the back of the plaster cast generally facilitates matters. At any rate, if the whole is left overnight, it will generally be found in the morning that the separation has taken place.

A plaster cast having been made, mouldings in other materials can readily be obtained.—*Photo. Review.*

THE NAMPA IMAGE.

In a lecture before the Brooklyn Institute, October 31, by Prof. G. Frederick Wright, of Oberlin, Ohio, upon "The Ice Age in North America, and its Relation to the Antiquity of Man," a brief account was given at the close of a very remarkable discovery recently made in Idaho. Prof. Wright's attention was called to it in a letter from Charles Francis Adams, president of the Union Pacific Railroad, written the 17th of September last.



THE NAMPA IMAGE.

The letter related to an image found about the 1st of August, by Mr. M. A. Kurtz, of Nampa, Idaho, who was engaged in boring an artesian well at that place. Nampa is a station upon the Oregon Short Line Railroad, about twenty miles from Boise City, and between the Boise and Snake rivers. This region, like much in the vicinity, is covered by extensive lava deposits of post-tertiary or quaternary date. The image in question was described by Mr. Adams "as apparently the figure of a female, one leg and one arm being missing, made of baked clay. It is just such a production as an ingenious boy, with a taste that way, might now produce."

We give an engraving, taken from the specimen itself, and of the full size thereof. The image is about one inch and a half in length, and came up in the sand pump in the ordinary way from a depth of about 320 feet below the surface. Mr. Cumming, the general manager of the Union Pacific lines in that district, was at Boise City the day after the discovery. He is a graduate of Harvard College, a thoroughly trained man, and well known in Boston. Mr. Adams and others who know him are ready to take his evidence in the case as conclusive in respect to the facts.

Mr. Kurtz was on the ground watching the progress of the work with much solicitude, and as the sand pump came up, ran the contents through his hand as it was dumped out, and so had the image in his hand before knowing what it was, supposing it was a twig; but on dipping it into a barrel of water and washing it, saw its character. The only other persons present at the time were Mr. Duffes, a prominent citizen of the town, and the driller and helper. The drill was not used after passing through the lava deposits, and the sand pump was of ample size for bringing up the image, the valve being three and one-half inches on the inside.

The following are the different strata bored through as reported by the driller: 60 ft. of soil, 12 to 15 ft. of lava rock, 100 ft. of quicksand, 6 in. of clay, 40 ft. of quicksand, 6 ft. of clay, 30 ft. of quicksand, 12 to 15 ft. of clay, then clay balls mixed with sand, then coarse sand in which the image came up, then vegetable soil, then the original sandstone.

To the suggestion that the image may have fallen into the well, or been thrown in, it is replied that the hole is tubed with a heavy six inch pipe from the top, and any light substance thrown in would have been ground to pieces by the action of the sand pump; furthermore, on subjecting the image to the scrutiny of Professor Putnam of Cambridge and Professor Haynes of Boston, it became evident that it was not a clay image, but had been carved from a light pumice stone, and that the coating of red material enveloping it was a cement of oxide of iron that must slowly have collected upon its surface.

An evidence of its genuineness exists in some particles of sand cemented into the crease between the arm and the body, which can be seen in the left-hand side of the front view of the accompanying cut. These could not have been where they are if it had been recently manufactured. Taking the evidence altogether, Professor Putnam and Professor Haynes are entirely convinced of its genuineness.

The subsequent questions to be determined relate to its age. A communication to Prof. Wright from Mr. S. F. Emmons, of the United States Geological Survey, expresses it as his opinion that the beds from which the image is supposed to have been derived are probably of far greater antiquity than any deposits in which human implements have heretofore been discovered. The occurrence of the beds is readily accounted for by inspection of the region. Through obstructions in the lower part of the valley of Snake River, probably caused by lava overflows, the water was dammed up and a lake formed. Into this lake the Snake River brought a rapid accumulation of material, doubtless from the melting glaciers near its head waters, so that a comparatively short time, a few hundred years perhaps, or a few thousand at most, would be ample for the accumulation of the sediment, when a lava outflow covered over the whole and sealed it up. Doubtless if we could freely excavate the old surface at this great depth, many interesting things would be found.

Before accepting, however, the extreme antiquity which Mr. Emmons is inclined to give to the image, we must wait for more detailed study of the region. It is proper to say, however, that it is in the line of the various discoveries of human remains reported by Prof. Whitney as made in the gold-bearing gravels of California, which, in many instances, are overlaid by extensive lava deposits. The Calaveras skull was one of these.

The discovery of so good a specimen of art as this Nampa image is, adds weight to the evidence which Mr. Whitney has presented, and supports his theory and that of Prof. Putnam, that the human race was much farther developed on the Pacific slope in the earliest times than it was on the Atlantic coast or in Europe, and the discovery will bear with strong weight against those who assume an unvarying and gradual evolution of the human species. It points rather to the degeneration of certain races. Orthodox theologians would be inclined to regard the image as a relic of antediluvian art.

What Produces Death.

Some one says that few men die of age. Almost all persons die of disappointment, personal, mental, or bodily toil, or accident. The passions kill men sometimes even suddenly. The common expression, "choked with passion," has little exaggeration in it, for even though not suddenly fatal, strong passions shorten life. Strong-bodied men often die young—weak men live longer than the strong, for the strong use their strength, and the weak have none to use. The latter take care of themselves, the former do not. As it is with the body, so it is with the mind and temper. The strong are apt to break, or, like the candle, run; the weak burn out. The inferior animals, which live temperate lives, have generally their prescribed term of years. The horse lives 25 years, the ox 15 or 20, the lion about 20, the hog 10 or 12, the rabbit 8, the guinea-pig 6 or 7. The numbers all bear proportion to the time the animal takes to grow its full size. But man, of all animals, is one that seldom comes up to the average. He ought to live a hundred years, according to the physiological law, for five times twenty are one hundred; but instead of that, he scarcely reaches an average of four times the growing period. The reason is obvious—man is not only the most irregular and most intemperate, but the most laborious and hard-working of all animals. He is always the most irritable of all animals, and there is reason to believe, though we cannot tell what an animal secretly feels, that, more than any other animal, man cherishes wrath to keep it warm, and consumes himself with the fire of his own reflections.

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Cotton Mill Life in India.

An Englishman now managing a cotton mill in India sends the following account of some of his experiences to a British journal:

As regards the mill hands, we have one minder, two creelers, and six piecers to each pair of mules of 700 spindles. The mules run four draws in one minute. We have two piecers to each throstle frame, two each to every slubbing, roving, and intermediate frame, and four to each drawing frame; also one man to every three cards. We have a separate oiler to every department. The minders are paid at the rate of 10 annas for 100 pounds of 20's, and so on accordingly in proportion to the counts of yarn they spin. They will average from $3 to $4.50 per month, creelers four rupees per month, piecers eight to twelve rupees per month. The rupee has been worth 1s. 6d. British coin, but is now valued at 1s. 4d.

We have an overlooker and assistant overlooker over every separate department, whose average wages are about $6 per month. I am now giving an account of our mill only. At some other places they get much higher wages. The head jobber over the weaving department gets $9 per month, the sizing overlooker 25 rupees, or $7.50, per month, the other loom jobbers get 15 rupees, or $4.50, per month, and a small bonus on the out-turn. We have six men to two slashing frames. The loom jobbers have 50 looms each. The very good weavers have two looms; others have one. Weavers earn from 10 to 16 rupees, $3 to $4.80, per month.

Steel combs and scissors are almost unknown here.

If a weaver has a float or a crack to put back he does it with a piece of old card fillet. There is no twisting of beams here. When a beam is woven, it is redrawn with a reed hook, one end at a time.

The people have some very peculiar caste prejudices and customs. I happened to crush against a man who was carrying his food one day, and it was instantly thrown away defiled.

We have men and women winders, they have sixteen ends each, and men warpers. All the mill hands are allowed to smoke. They have a place especially for the purpose in the yard, and you may see at any time children about twelve or thirteen years old working alongside of their parents. In winter time the engine starts at 6:30 A. M., and runs till 6 P. M., stopping only half an hour for dinner. In summer we start at 5:15 A. M. and stop at 7:45. In fact, we work from sunrise to sunset each day, only stopping on Sundays occasionally. There are, however, some few holidays, Hindoo and Mussulman, during the year. We have Hindoos, Afghans, mulattoes, and Mohammedans working at our mill, and very bad indeed they are to manage. At the least provocation they will turn out *en masse*. They are, as a rule, not very intelligent, though very cunning, and will make any sort of excuse to stop off work. I noticed that one asked off and got leave to bury his father three times!

As the monsoon season is now on, we are very badly off for hands. A great many of them live in the villages and outlying districts across the river. As the river is very much swollen, they cannot get across. We have four boilers here, and burn nothing but wood, principally Cabul and tamarind, as coal is so very expensive. We have to lay up a store for the monsoon season, as then the roads are impassable. I have seen as many as 200 bullock gharries coming down to the mill at once, each gharry having four bullocks yoked to it. A very lively scene, I assure you, especially when the drivers are having a heated discussion. It is a very interesting sight at sunrise to watch the people wash and bathe in the river. As our bungalow is built on the city wall, and the river flows 30 feet beneath, we have a splendid view. We often see from 200 to 300 bathing and washing at once. It would be a treat to an English housewife to see the contrast between her mode of washing and the style they have here. They use a big stick here instead of a dolley or washing machine.

The women, as a rule, are very straight and of graceful carriage, in consequence of being trained from childhood to carry chattels or drinking vessels on their head. They are very expert at this, and very rarely let one fall. You may see women building houses and factories and mending the roads. They do all the laborious work. Just imagine at home a woman laboring for a man building a factory chimney. It's the case here.

A New Method of Leaf Printing.

Mr. Walter Gardiner, M.A., Fellow of Clare College, Cambridge, and lecturer on botany in the University, has discovered a new method of printing photographic negatives, employing living leaves in place of sensitive paper. Mr. Gardiner read a paper on the subject before the British Association. Before dealing with the immediate subject of his paper, the author described how prints may be obtained from *Protococci* or the free swimming swarmspores of many green *Algæ*. It is possible to take advantage of their sensitiveness to light. Into one end of a watertight box a thin glass plate is securely fitted. The negative to be printed is then placed next the glass, film side nearest. The box is filled with water containing a fairly large quantity of swarmspores. The lid is shut down, and the whole is exposed to diffused light. In the case of a strong and well-developed negative, the swarmspores swim toward the most highly illuminated parts, and there in the greatest numbers come to rest, and settle upon the glass, so that, after some four or six hours, on pouring out the water, and removing the negative, a print in green swarmspores can be obtained. The print is dried, fixed with albumen, stained, and varnished. The author then dwelt upon the well-known fact that the whole of the animal life upon the globe depends directly or indirectly upon the wonderful synthetic formation of proteid and protoplasm which takes place in the living tissue of plants containing chlorophyl, *i, e.*, green plants, or, to be more exact, in the green chlorophyl corpuscles.

He stated that whatever is the exact chemical nature of the process, this is at least clear, that the first *visible* product of the assimilatory activity is starch, which, moreover, is found in the chlorophyl grains. The presence of this starch can be made manifest by treating a decolorized leaf with a water solution of iodine dissolved in potassic iodide. This formation of starch only takes place under the influence of light; the radiant energy of the sun providing the means of executing the profound synthetic chemical change and building up proteid from the carbonic acid of the air, which is taken up by the leaves and the salts and water absorbed by the roots. If a plant (and preferably a plant with thin leaves) be placed in the dark overnight, and then brought out into the light next morning, the desired leaves being covered with a sharp and well-developed negative, starch is formed when light is transmitted, and in greatest quantity in the brightest areas. Thus a positive in starch is produced, which can be developed by suitable treatment with iodine. (A leaf was then developed, and handed round to the audience for inspection.) The author showed that it might be possible to obtain a permanent print by suitable washing and treatment with a soluble silver salt, silver iodide being formed. The author regards this discovery as a most striking illustration of the way in which plants are working for themselves, and so for all living things, and points out that the extraordinary manner in which the green parts of plants—so to speak—catch the radiant energy of the sun, and employ it for analytical and synthetical chemical processes, may be easily and clearly demonstrated.

Japanese Art.

I would like to say a great deal about Japanese art, or rather I wish that I were qualified to do so, because I have been deeply impressed by it. One thing that what I have seen in this country has convinced me of is that at home there is an utterly erroneous idea of what art is at all; the idea held by the vulgar multitude, at any rate—of whom I count myself one—that it consists in picture making, and statue making, and analogous performances, appears to me now to be very absurd.

I conceive that art which is confined to one class of a people, and extends to only one class of subject, is not true art, and that art in a whole people, if it is to be in the least true, must be spontaneous and unconscious, and that it must penetrate into all the works of even the meanest of the people. This is greatly the case in Japan.

The commonest thing that is made or used has a grace and beauty about it that is quite wanting in things for common use at home. I am struck with thus much more in the case of quite cheap things for everyday use than in that of the more elaborate articles that commonly find their way to England.

Among a set of common Japanese cups, saucers, and teapots, the whole lot costing, perhaps, a shilling, English earthenware looks positively barbarous; but a single Japanese cup will not look other than beautiful beside anything, and the same may be said of all the commonest things.

A Sake bottle—the analogue of our decanter—which costs a penny or twopence, would be an ornament anywhere. In the poorest houses, things that we would never dream of using—common, rough bits of wood and stone—are used, and are disposed of in such a manner that shows a true feeling for what is beautiful.

The drawing of the Japanese is notoriously lacking in perspective, and I must admit that I do not vastly admire the more ambitious attempts, but I think the very common drawing that is used for decorating even the poorer houses is often perfect. A few strokes—made with a brush and black color—indicate a flower or a gracefully bending plant, and one could not conceive that a line could be altered by the distance of a hair's breadth and show any improvement. These things are done, not by professed artists, but merely by handicraftsmen.

I believe that all this results greatly from the absence of anything corresponding to the system of wholesale manufacture that we have.

The Japanese are not, as I have already said, a mechanical people, and have naturally no idea of all the methods that we have, by division of labor, the use of machinery, and so forth, of turning out a vast number of articles. Every little thing is made, from beginning to end, by one workman, and, as a consequence, it contains, to a certain degree, a reflection of the individuality of the maker, without some of which, I imagine, no beauty is possible.

In a certain sense every workman becomes an artist, and the thing must act and react. He is an artist in the sense of creating something that has some beauty in it; he becomes an artist in unconsciously learning to love that which is beautiful and to hate that which is ugly.—*Br. Jour. of Photography.*

Note on a New Vehicle for Typewriter's Ink.

BY PROF. E. B. SHUTTLEWORTH.

Various formulas have been published for the preparation of ink for use in typewriting machines, but, as far as I have learned, they have proved more or less unsatisfactory. This has, in great part, arisen from the use of glycerine as one of the prime constituents. The hygroscopic properties of this substance render its use ineligible under varying climatic conditions as to moisture, and the addition of glucose, soap, alcohol, or water does not remove this objection. Vaseline, with or without wax, gives better results in this respect; but a good consistence is not easily secured under extremes of temperature.

Some years ago, when specially interested in the study of inks, I made a number of experiments on a compound suitable for typewriters' use. The results were satisfactory in indicating the line of success, and the notes then made were laid aside until more leisure could be secured for their complete elaboration. Somehow or other that time has not arrived, and, lest another seven years should so elapse, I beg to turn over what little information I have to convey to those who are less busy or perhaps more industrious.

Many of the salts of the aniline series are soluble in castor oil; methyl violet is notably so. I am not prepared to state the limit of solubility, as with a vehicle of such consistence, and with pigments of such intensity, this is a difficult point to determine. The amount dissolved is, however, relatively great, and advantage can be taken of this fact for the preparation of an ink of remarkable power, admitting of a large number of copies being taken from the same impression. Other anilines, as some of the blues and greens, may be substituted for violet, and the color may be varied, and permanency increased, by the incorporation of a quantity of the finest grade of lampblack. I did not experiment with nigrosine, but it is possible that it would produce a black of some intensity.

The incorporation and solution of the aniline colors in the oil may be accomplished, on the small scale, by triturating the previously powdered color with the oil in a mortar. The use of a little alcohol will sometimes be found to facilitate this operation. The ink may be applied to the ribbon by means of a tooth brush, and the ribbon may be of silk or fine muslin. Strips of very fine "lawn" answer admirably. On a larger scale, the grinding and mixing of the color would, of course, be better done by revolving rollers, as in some forms of paint or chocolate mills, and the application of the ink to the ribbon could be easily provided for.

Laboratory, Ontario College of Pharmacy, Toronto.

A Gigantic Reservoir.

The present dam of the Bear Valley Reservoir Co. in San Bernardino was constructed in 1885, and is 50 feet high, 16 feet thick at the base, 3 feet at the capstone, and 300 feet in length. It is built into the bed rock at the bottom of the Bear Creek Canyon, and abutted into the solid rock on either side. The body of water confined by this dam covers 1,965 acres to an average depth of 16 feet, and contains 10,000,000,000 gallons. The engineer of the company, Mr. Frank E. Brown, is now in the East, but upon his return active steps will be commenced to construct a new and larger dam, the work upon which will be begun early next spring. The new dam will be located about 100 feet below the present one, so that the water will be confined by a double dam. It will be built into the bed rock, and be 120 feet in height. The width of its base will be 84 feet and its length 650 feet. The capacity of the reservoir will be increased nearly twentyfold, and will include a body of water 12 miles in length, 3 miles in width, with an average depth of 40 feet. The present dam with its canals cost $165,000. The cost of the new one has not been estimated yet, but will probably reach nearly three-quarters of a million, and will store water sufficient to insure irrigating water for 100,000 acres of land for three years.

Professor Davidson recently made a thorough examination of the watershed and catchment area of the reservoir site, and also examined the dam site, and indorsed very highly the feasibility of the new enterprise, stating that he never saw equal facilities for storing so vast a body of water at the same cost.

The Bear Valley reservoir is at present the largest irrigation reservoir in the United States, and the proposed increase in its capacity will make it the largest of any kind.—*Pacific Lumberman.*

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MODIFIED WIMSHURST MACHINE.*

The Wimshurst electrical machine is the most recent and on some accounts it is the best that has been devised. It is less affected by atmospheric conditions, and may be relied on in all weathers for results of some kind, while the frictional machines and the induction machines of Holtz and Toepler generally fail in a damp atmosphere.

The Wimshurst machine here shown differs from the ordinary type, mainly in having the rotary disks inclosed by a hoop and glass cover disks to exclude dust and moisture, the stationary disks being provided with brushes which are connected electrically by strips of tin foil secured to the inner faces of the outer disks by means of shellac.

This machine is shown in perspective in Fig. 1. Fig. 2 is a vertical section taken through the center of the disks, and Fig. 3 is an enlarged horizontal section taken on the line of the collectors.

The column supporting the revolving disks is provided with a hollow arm in which is journaled a tubular shaft, upon one end of which is mounted a disk of common window glass between two collars, the glass being centrally apertured to receive the shaft, the outer collar being screwed on.

The opposite end of the tubular shaft is provided with a grooved pulley. A solid shaft placed within the tubular shaft, and projecting beyond the ends thereof, carries upon one end a glass disk, and upon the other a grooved pulley, as in the first case. The glass disks are separated from each other about ⅛ inch. They are both coated with shellac varnish and allowed to dry. To each glass disk near its periphery are secured sixteen radial sector plates of tin foil or thin brass, arranged at equal angular distances apart. These sectors are coated on one side with shellac varnish and allowed to dry, when they are placed in position on the varnished glass disks, varnished side down, and secured by rubbing each one quickly with a warm, smooth iron.

A drawing should be made of a glass disk with the sectors to be placed under the disks as a guide in locating the sectors. Brass sectors are preferable on account of their superior wearing qualities.

The glass disks are placed on their respective shafts with the sectors outward. A ring of vulcanite surrounds the glass disks and is grooved internally to receive the stationary glass disks, which inclose the rotary ones. The vulcanite ring is divided at the top and bottom to allow of applying it to the stationary plates. The rear plate is centrally apertured to admit the tubular support of the shafts. The vulcanite ring is provided, at the top and bottom, where it is divided, with vulcanite dowels, and is supported by attachment at the bottom to the base board, and at the top to a wooden rod projecting from the upper end of the column.

In diametrically opposite sides of the vulcanite ring, and on a level with the axis of the disks, are inserted brass rods, provided on their inner ends with metallic forks, the arms of which extend along the outer surfaces of the rotary disks and are provided with collecting points, as shown in Fig. 3. The outer ends of the brass rods are furnished with knobs, into which are inserted the supports of the discharge rods or conductors. The latter are provided with vulcanite handles, by which they may be moved in these supports as may be required.

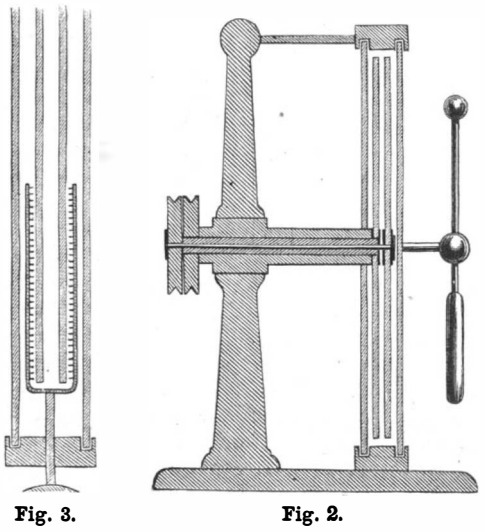

Fig. 3. Fig. 2.

SECTIONAL VIEWS OF MODIFIED WIMSHURST MACHINE.

The stationary glass disks are each provided on their inner faces at diametrically opposite points with small metallic sockets, attached to the glass with cement, and containing brushes of tinsel or very fine brass wire, which touch the rotary disks lightly. The brushes of each pair are connected by a narrow strip of tin foil attached to the glass. The stationary glass disks may be turned in the vulcanite ring to adjust the brushes at the required angle, which is about 45° with the plane of the collecting forks.

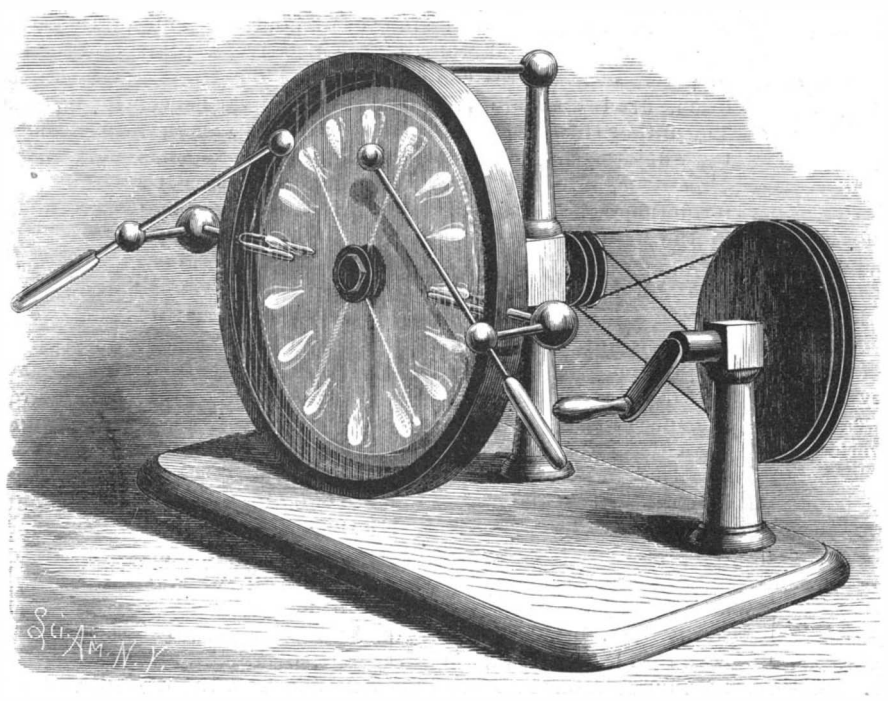

Fig. 1.—MODIFIED WIMSHURST INDUCTION MACHINES.

One of the rotary disks is driven by a straight belt, the other by a crossed belt, both belts being carried by a doubly grooved wheel fixed to a shaft journaled in a standard attached to the base. This shaft is furnished with a crank, by which it is turned.

To secure good results, small Leyden jars or condensers must be connected with the conductors, as shown in Fig. 4. To the bottom of each jar is attached a small chain. These chains are brought into contact when a detonating discharge is desired, and separated for a silent discharge.

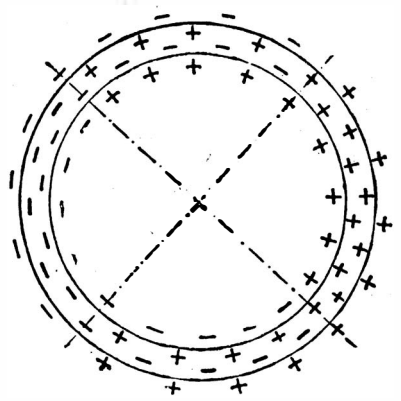

Fig. 5.—DISTRIBUTION OF ELECTRICITY UPON THE PLATES.

The machine is self-exciting, and yields sparks varying in length from one-fourth to nearly one-half of the radius of the rotary disks, according to the state of the atmosphere and the condition of the machine.

The machine illustrated has 12 inch rotary disks and 14 inch stationary disks.

Mr. Wimshurst has constructed the diagram (Fig. 5) which shows the distribution of the electricity upon the plate surfaces when the machine is fully excited. The inner circle of signs corresponds with the electricity upon the front surface of the disk. The two circles of signs between the two black rings refer to the electricity between the disks, while the outer circle of signs corresponds with the electricity upon the outer surface of the back disk.

The inventor found by experiment that when two disks made of a flexible material were driven in one direction, they close together at the top and the bottom, while in the horizontal diameter they are repelled. When driven in the reverse direction, the opposite action takes place.

The Shape of Oak Leaves.

Sir John Lubbock read a paper before the British Association on "The Shape of the Oak Leaf," which is so unlike that of any other of our forest trees. The three points then which give the oak leaf its peculiar form are:

1. The deep, rounded sinuses. 2. The want of symmetry of the two sides. 3. The oblong or oblanceolate outline. I do not know of any attempt to explain this peculiar form. As regards the sinuses, Kerner suggests that they are intended to permit the passage of light to the lower leaves. I would not deny that the space between the lobes may be of some advantage in the manner suggested by Kerner, but I greatly doubt whether this is the main or primary explanation. That which I would suggest is as follows:

The leaves of the evergreen oaks are entire, and small in comparison with those of the English oak. During the winter and early spring they are protected by a series of brown scales, inside which they lie, and with which they form the well known buds which are so familiar to us, and which are both small and short in proportion to the size of the leaves themselves. In cooler and moister regions, on the contrary, there is a tendency for leaves to become larger and deciduous. These influences do not affect the outer scales, which remain as before, without any increase of size. But as the leaves have increased in size and the scales have not, the leaves can no longer retain their original arrangement in the bud. If, for instance, we compare the buds of the oak and of the beech, we see that while the leaf of the oak is longer than that of the beech, the bud of the oak is, on the contrary, shorter than that of the beech.

Under these circumstances, what must happen? The leaf grows and becomes longer than the bud. It is therefore necessarily bent into a curve. But an entire leaf, if thus thrown into a curve, would necessarily fall into folds, the number being determined by the number of ribs or veins. For such folds, however, there would be no room within the narrow limits of a bud, or rather perhaps they would be inconvenient, because they leave more or less empty spaces. The sinuses are due, Sir John believes, to the curvature of the leaf, owing to the shortness of the bud in comparison with the length of the leaf. The young leaf is not only curved—it is wrapped round the interior leaves.

The result of this is that one side of the leaf is folded within the other. The one being on the outer side has, therefore, more space than the other. The two sides of the leaf are, in fact, differently situated, and this accounts for the second point—namely, the want of symmetry. The oblong form is an advantage, from the way the leaves diverge from the stalk. In this manner the interesting peculiarities of the oak leaf may be accounted for.

THE Nicaragua Canal Company, after exhaustive preliminary surveys, borings, etc., and the preparation of complete maps and profiles, has now started in on actual work. Improvements are now being made at the harbor of Greytown, on the Atlantic side, and rails and cars for construction lines, telegraph wire to complete the extension of the government wire across the isthmus, and an 8 inch spiral riveted steel pipe to convey a water supply from the Deseado basin to Greytown, have been shipped from New York. The total length of the route, as finally located, is 170 miles; of this length, 121 miles is free navigation of Lake Nicaragua and the San Juan River, requiring only a little dredging and improvement; 21 miles is free navigation of basins formed by the flooding of two valleys, leaving 28 miles only of canal excavation. There will be five locks, two on the eastern, three on the western division. The curves average about 5,000 ft. radius, with maximum curves of 2,528 ft., one of these being in the divide cut, and the other in the river; about two-thirds of the route is on tangent. To bring the water in the basins up to the required level, some rock-filled dams or embankments will be built at low points of the sides. The climate is healthy, with a steady trade wind across the isthmus. There will be 23,489,478 cubic yards of earth dredging, 16,440,368 cubic yards of earth excavation, 15,008,347 cubic yards of rock above water, and 575,445 cubic yards of rock under water, also 14,714 cubic yards of excavation for harbor works. The locks will be of concrete, with stone facings. The total cost for construction, exclusive of hospitals, shops, etc., is estimated approximately at $55,000,000.

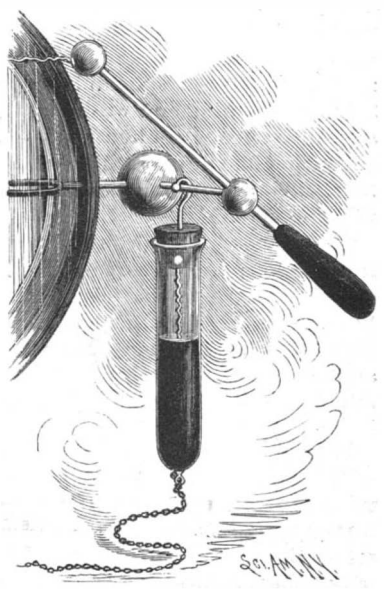

Fig. 4.—ATTACHMENT OF THE LEYDEN JAR.

*From "Experimental Science," by George M. Hopkins. Munn & Co. publishers, New York.

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Mica.

Mica is a mineral that has attracted some attention for the past few years in the Southern States, particularly in North Carolina, and large mica mines are now being developed in South Carolina.

The principal use to which the mineral has been put heretofore was for stove doors and for decorative purposes, such as bronzing, wall-papering, etc. When properly prepared, it can be used for a variety of purposes, and the discovery of this fact has led inventive genius to supply a process whereby it can be so utilized, and machinery has been brought out for the purpose of handling the mineral.

The new field thus opened to this mineral is as a lubricant for railroad purposes, and its value for this purpose lies in the fact that it is absolutely anti-friction, and it is claimed that with its use hot boxes or journals are simple impossible.

Mica abounds in large quantities in Colorado, and this new process of utilizing it is the invention of Mr. S. W. Kemble, of Denver, who also invented all the machinery used in its manufacture.

A company has been incorporated in that city under the name of the Railroad Mica Lubricating Company, with a capital of $200,000, and they have purchased the machinery, together with the process of manufacture, all of which are covered by patents, and employed Mr. Kemble as manager of the business.

A visitor to the factory thus describes operations: The mica comes to the factory in carloads, just as it is taken from the mine. It is fed by boys into two machines, which cut it into fragments about half an inch in size. By a system of pneumatic tubes the mica, so cut, is delivered to the atomizing machines, which grind it into powder.

These machines one must see to fully realize their peculiar action and construction. Each machine consists of two steel shafts three feet long, with a series of gun metal spirally arranged beaters, which revolve in a closed case forming a figure "∞."

When in operation these machines make from 5,000 to 7,000 revolutions a minute. The beaters on the revolving shafts are so arranged that the fingers on one pass between the fingers on the other shaft, so that when the material is passed through the pneumatic tubes from the feeding machine to the atomizers at a velocity of 15,000 feet a minute, the work of atomizing is instantaneous.

The mica, now reduced to atoms, continues its course at the same velocity through another set of pneumatic tubes to the sitting bins. Here the current is so retarded by the peculiar mechanism that it causes the material to settle in the various compartments, of which there are six, at the same time grading the material according to its fineness. The powdered mica is now settled in the hoppers or bins, immediately over the mixing pans. Here the several grades are drawn into the pans, which are provided with mechanical mixers, and the lubricant is made up by the use of the proper percentage of oils, mica, and such other ingredients as the company uses in the manufacture of the product.

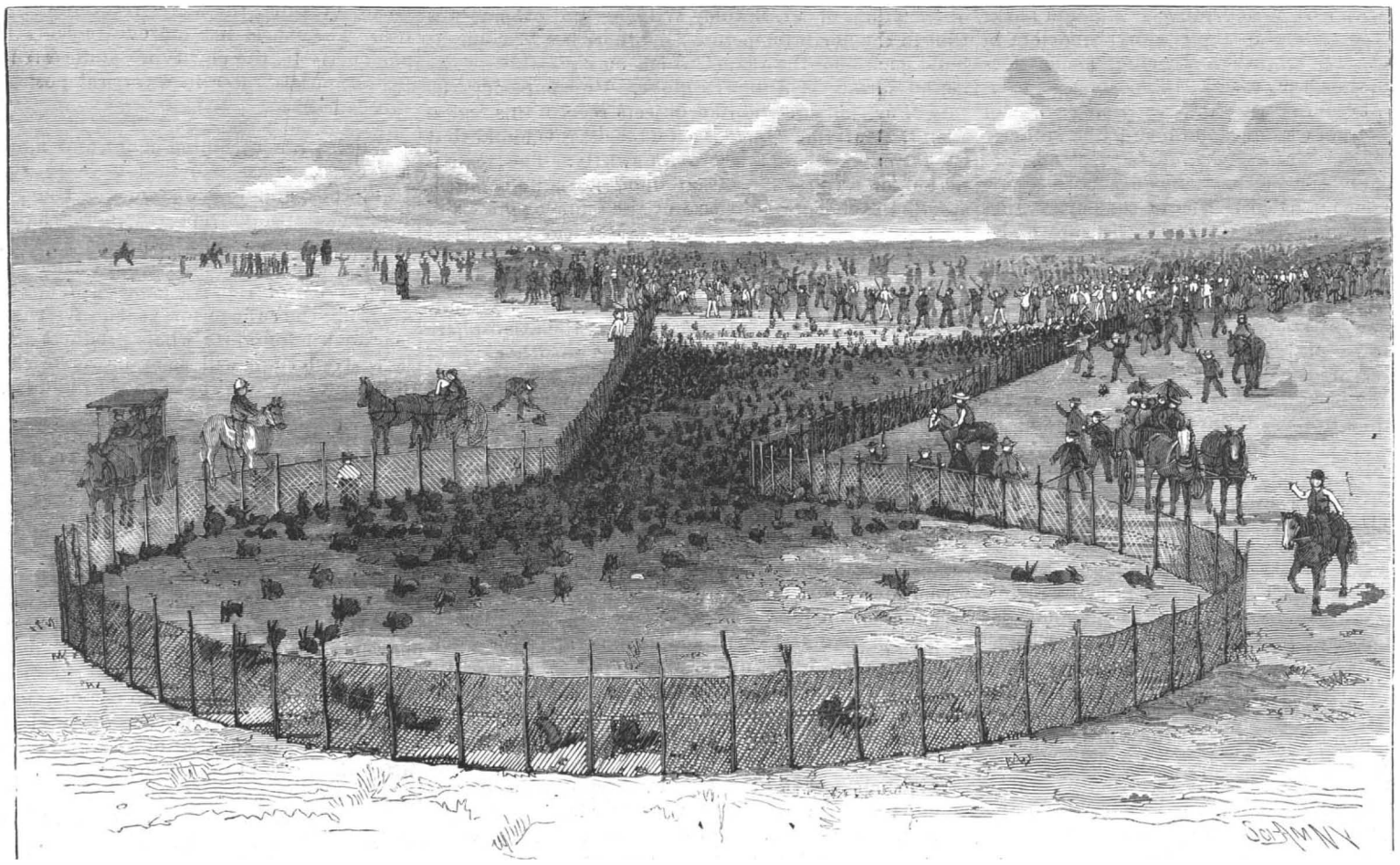
Directly over the hoppers are located the oil tanks, which supply the mixers by a pipe running down on the outside of the hopper, on the end of which is a faucet.

At the south end of the bins there is located a large cylindrical machine four feet in diameter and ten feet high, that is called a dust arrester. Any of the material that is so light and fine that it will not settle is driven into this machine by air currents, which thoroughly separate the mica dust from the air, where it settles in the bottom of the machine and is drawn off as needed.

It is stated that the capacity of all machinery heretofore made for pulverizing mica has been from 300 to 400 pounds a day, and then the material has not been sufficiently fine for lubricating purposes. It is claimed for this new concern that it can pulverize about five tons a day, or in ten hours' running.—*A. P. Reynolds, in Dixie.*

A CALIFORNIA RABBIT DRIVE.

Our illustration represents the result of a rabbit drive in March last at Wildflower, Fresno County, California. The mound of slain at the end of the drive was five feet deep, twenty feet wide, and forty feet long, and contained twelve thousand dead rabbits, the largest and most successful drive ever made in California. These vermin have become so numerous and destructive to the farmers, that the wholesale extermination of them is imperative. It is estimated that five rabbits consume as much as one sheep. They are particularly fond of young grape vines, fruit trees, corn and other grain. This drive was made by stretching fine wire netting about three feet high and seven miles in length, V shaped, terminating at the smaller end in a circular corral into which the animals were driven and readily killed with stout sticks.



A CALIFORNIA RABBIT DRIVE.

The Proposed Bridge across the English Channel.

Under ordinary conditions the English Channel is beset with dangers for the mariner. There is rough water, contending currents, a crowding of ships, and frequent and heavy fogs. Add to these a line of bridge piers in the most frequented part, and the perils of navigation might truly be looked upon as formidable. Let us imagine a sailing ship beating across or standing down channel, riding up and plunging down the heavy seas. Suddenly the look-out, peering through the thickness, descries the grim form of a bridge pier under her lee with the current sweeping her down upon it. Jammed up to the wind as she is, she cannot go a-weather, save to come about, and, unless the discovery is made in time, she is doomed. Indeed, even with sea room she might mis-stay, and her master be unable to wear her round in time.

As every traveler knows, the boats of the channel ferry—stout, powerful boats they are too—sometimes refuse to make the passage, because of heavy weather and thick fogs. But the traffickers between the German Ocean and the Atlantic have no such alternative and must keep the seas, their greatest peril the chance of collision. Add to this a line of stone piers immediately in their track, the exact position of which it would be impossible to determine in thick weather, and the hardiest mariner would be warranted in turning back on his course.

Wool Raising in the United States.

The first sheep introduced in the United States were taken to Jamestown, Virginia, in 1609. Great efforts were made to encourage the woolen industry, and some years later a law was passed which compelled every family to spin 3 lb. of wool, cotton, or flax per week during 30 weeks of the year. About the same time the first weaver settled in the country and received a grant of 30 acres of valuable land. In 1662 Virginia prohibited the exportation of wool and offered 5 lb. of tobacco as a premium for every yard of woolen tissue produced in the colony. The breed of the sheep at the time in America was, however, inferior, and it was not until the commencement of the present century that the Spanish government consented to sell a flock of fine merino sheep at an exorbitant price for exportation to America. It is stated that even in 1810 there were only about 5,000 sheep of good breed in the country, but from them sprang the large flocks which are now found in the United States. The first cloth mill worthy of the name was erected in 1788 by several of the inhabitants of Hartford, Connecticut, and its annual production amounted to 5,000 yards. It is stated that the proprietors of this establishment presented Washington with a suit made of their cloth in 1791. Other works soon arose, and in 1810 there were five mills producing fine woolen tissues, and 19 which manufactured coarser descriptions, their aggregate production being 200,000 yards, and a considerable quantity was also produced on hand looms.

The war in 1812 gave a great impulse to the American woolen trade, but when peace was concluded British tissues were imported in enormous quantities and completely crushed the industries of the States. Congress then found it necessary to protect the American manufacturers, and imposed in 1816 an import duty of 25 per cent *ad valorem* on woolen tissues, and in 1824 it applied a duty of 15 per cent on raw wool costing less than 10 cents per pound, and of 20 per cent on wool costing more than 30 cents per pound.—*Draper's Record.*

A Spectroscope without a Lens.

Prof. Philip Braham, F.C.S., said in a paper read at the British Association, Section B: The instrument consists of a taper tube with an adjustable slit 2½ inches long, similar to a parallel rule at one end and a prism at the other. The length of the tube should allow the slit to be at the distance of distinct vision. Although the spectroscope is without a lens, the eye acts the part, and produces the image on the retina, which image is dispersed by the interposed prism.

Comparison prisms or mirrors can be easily placed before the slit, and the instrument can be easily made by any one with ordinary constructive ability at a small cost, enabling those whose means are limited to experiment, verify facts, and penetrate the charmed circle of brass and glass, to the popularization and advancement of science.

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Central Park Natural History Notes.

Frost has come and nipping airs from the northward; the tropic animals, instead of taking train and boat for the South, being housed, and the climate of the natural habitat of the birds simulated by the aid of a furnace. The Florida alligators, of which there are fifteen, were not easily moved from their pool, which is just outside the tiger house. It took six men to handle the big ones, Superintendent Conklin taking the precaution to put a strong lashing of rope around their ponderous jaws, and even then the six men had a struggle with each as they lifted it from the ground, for the tail of the alligator is almost as much a weapon of defense as the jaws, having, indeed, enough force to knock a man over or to even break his arm or leg. A curious characteristic of the alligator is that, when in captivity, it will not take food during the winter. In its habitat it buries itself in the bottoms of muddy rivers or stagnant pools at the approach of winter, and does not awaken from its lethargy till warm weather comes. In captivity, cold weather brings drowsiness. For days, sometimes for weeks, it lies motionless, only stirring at times, as though for the noise, moves a few feet along mechanically, its eyes scarcely opened, and then drowses off again. Last winter the park alligators would not taste food, not even their favorite, fish, though the park keepers repeatedly offered it to them.

Little trouble was had in moving the hippopotami, though one of the pair weighs 1½ tons, the keepers opening the gate, surrounding their tank on the lawn, and coaxing them with carrots and other succulents along a temporarily fenced way to their winter quarters in the lion house. The rhinoceros, coming as he does from the warmest part of Africa, is kept housed even in the summer, because of the danger from such cool periods as come from time to time during the summer solstice.

A baby nylgau (*Portax tragocamelus*), born a few weeks since, is one of the curiosities of the park. Just now it is only a puny and comical caricature of its mother, a large and magnificent animal belonging to the antelope family, its habitat being India, and very rarely breeding in captivity. It recalls our giant moose in more ways than one, though the head, instead of being of the ox pattern, is very similar to that of the horse. The ears are large and well rounded, the body slopes away from the base of the neck, the tail is long and ends in a brush. It loves the forest and, in its native wilds, feeds principally upon the leaves of the Indian maple.

An American lion, or puma (*Felis concolor*, Linn.), has been given the park by Capt. Burdick, of the Morgan line, a recent steamer bringing it from Mexico. It is but a cub, only about two months old, and, as yet, has not put off its forest manners, being savage and vicious. It is the same species which the pioneers used to call "painter," probably a corruption of panther. Just now it has yellowish spots on a tawny coat. Later on it will be pale reddish brown above, with white on the flanks and lower limbs and grayish white on neck, muzzle, and inside of legs, the whiskers white and set in brownish black, the face and sides striped. It will be about 6½ feet long from nose to tip of tail. In Central and South America it is a terror to the herdsmen, for its mischief among the flocks. It will wait for hours upon the bough of a tree near where deer come to drink, dropping down upon them and often killing several before they can escape, so quick he is.

The curious axis deer of India (*Maculata*, Gray), recently born, resembles, in marking, the fallow deer; but its horns, when developed, will have no palmations. It is famous in Bengal for the flavor of its flesh.

Another recent arrival is the oaudad, or Barbary wild sheep. It comes from the Atlas mountains of Morocco, and has big horns and long fleece.

A Lady Amherst pheasant (*Thaumalea amherstiæ*, hab. Szechuen, China), given the park recently by Mr. Rockefeller, is the first of the kind ever brought hither, and very rare. It has the markings of both gold and silver pheasants, but is more brilliant than either. This order of pheasants was discovered in China only ten years ago, Lord Amherst being then British minister, hence the name. The first one taken to Europe fetched $2,500. It has the silver pheasant's tail and the golden pheasant's body, and will cross with other pheasants.

Wonderful Scenes on Jupiter.

Astronomers have of late been making some exceedingly interesting discoveries about the huge planet Jupiter, which is now visible in the evening sky. When we are thinking about worlds it is just as well to think of Jupiter, for that is a globe worth pondering over. Thirteen hundred times as large as this big earth of ours, and illuminated by four obedient moons, Jupiter has uncommon claims to consideration. But it is not so much the gigantic size of that wonderful planet as the extraordinary appearances and occurrences upon its surface that command particular attention at present.

Most readers know that when Jupiter is looked at with a telescope certain bands, or belts, are seen extending in parallel lines across the disk. We ordinarily see the great planet thus represented in illustrated books of astronomy. It is among these belts of Jupiter that the astronomers have observed some very surprising things. The most conspicuous belts lie on either side of the planet's equator, in what upon the earth we should call the tropical latitudes. Jupiter's equator, however, is so slightly inclined from the plane of its orbit that his tropical circles do not extend as far north and south as the belts lie. The first explanation that naturally occurs to the observer who watches these belts is that they must be enormous bands of cloud encircling the giant planet on each side of its equator. If he has a powerful telescope and a patient mind, he discovers that changes of form and position occur in the belts, which strengthen the probability that they are composed of clouds. The various colors that they show, and in particular the prevailing red tint which characterizes the largest belts, may excite wonder as to the nature and condition of masses of vapor that could present such an appearance, but upon the whole there seems to be nothing to seriously discredit the idea that the greater number of these phenomena really are clouds.

And now we come to the most surprising facts. It is evident that a tremendous current is continually sweeping right around the huge globe of Jupiter over its equatorial regions. The cloud belts are all in motion, but not all with the same velocity. The nearer they are to the equator, the faster they move. The observations of Mr. Stanley Williams and others show that in the north temperate zone there is a broad light band encircling the planet which may possibly be the actual surface of Jupiter's globe. By comparing the rate of motion of cloud-like objects seen in this region with that of the adjacent cloud belt, it is found that the latter is moving much more swiftly. The general period of Jupiter's rotation upon its axis, notwithstanding the enormous size of the planet, appears to be a little short of ten hours. But the equatorial clouds go around in about nine hours and fifty minutes, while the clouds 30° north and south of the equator require five minutes longer to complete a circuit. In other words, the equatorial part of the atmosphere appears to be flowing past the regions on either side of it at the rate of some 240 miles an hour! This, as M. Flammarion has remarked, is incomparably faster than the most violent cyclone upon the earth. And this gigantic current of wind, if so it may be called, forms a perpetual hurricane, blowing around Jupiter as unremittingly as our trade winds, but with inconceivable power and energy. The result of the varying velocities with which adjacent portions of the Jovian atmosphere appear to move should naturally be the formation of enormous whirling storms, cyclones, and tornadoes of incredible fury.

It is probable that, looked at in a vertical section, the atmosphere of Jupiter would present an equally remarkable contrast and conflict of motions. There is evidence that the dark-colored spots, or clouds, are at a greater elevation than those of a lighter hue, and it has been observed that the dark spots move more slowly than the bright ones. It follows that the deeper you go into the atmosphere, the faster it is found to be moving, and hence it may be that the actual solid surface of the planet, if any solid surface it has, rotates within its shell of clouds considerably faster than the shell itself turns.

Another very singular phenomenon of the strange and tremendous planet Jupiter is the great red spot which has been seen upon its southern hemisphere ever since the summer of 1878. Incredible as the thought seems, and difficult as its explanation upon any analogy drawn from terrestrial geology undoubtedly would be, there are certain facts which suggest the possibility that this phenomenon may be an elevated region of the planet thrust up through its environment of clouds. It must be remembered that the so-called red spot, which really appears only as a small oval blotch upon the disk of Jupiter, is in reality some 30,000 miles long and 7,000 broad. Think of a mountain of those dimensions raised above the clouds! Then, to add to the startling suggestions of the hypothesis, the color of this gigantic elevation or protuberance is a fiery red. Perhaps the strongest reason for regarding the red spot as an elevated mass is the fact that the clouds of the southern cloud belt, close to which it lies, never pass over it, but on the contrary, in passing by it, are driven out of their course and curve around its southern border, just as clouds in the earth's atmosphere glide along the shoulders of lofty mountain peaks whose summits rise above their level. It might be urged in behalf of this view that, inasmuch as the force of gravity on Jupiter is nearly two and a half times as great as on the earth, the major portion of its atmosphere must be pressed close to its surface, and that consequently its clouds do not float at such a height as the gigantic proportions of the planet might otherwise lead us to expect, so that the elevation of the red spot need not be supposed unduly great in order to place it above the general level of the cloud strata. Then there is the commonly accepted theory that Jupiter is yet in an early stage of development to support the hypothesis of the elevation of a large region of its surface in the manner in which parts of the earth's crust were thrust up, folded, and crumpled in the fiery ages of its history.

However we look at them, these strange discoveries on Jupiter indicate that but a very small part of the energies of creation are centered upon our own little globe. Jupiter has winds and storms and clouds and geological convulsions that make the great events of terrestrial existence seem but a miniature representation of planetary life. After all, the man who is said to want the earth doesn't appear to be so very grasping; if he wanted Jupiter, his ambition would be truly gigantic.—*N. Y. Sun.*

Notes.

A new use has been found for the carrier pigeon in Russia—carrying negatives taken in a balloon to the photographer's. The *Novoe Vremya* gives an account of some experiments to this end recently made, in which the Czar's winter palace was photographed in the air, the plates being sealed in paper bags impenetrable to light, tied to a pigeon's foot, and sent to the developer.

The Crescent City, a new stern-wheel boat with a newly devised feathering wheel, tried at Dubuque recently, made 18 miles an hour against the current, the same running at the rate of nearly 2½ miles an hour. This performance was made with 140 pounds steam pressure, the wheel revolving 23 times per minute. The wheel has only 10 buckets instead of the customary 16, the new type paddles striking and coming out of the water in a vertical position—feathering it is called.

Whales are becoming more and more plentiful on the coast. Last winter four were sighted off the Hamptons, and one off Quogue (Long Island). The Nantucket people reported more whales in sight two winters ago than have been seen since the time when there was an open-boat whale fishery on the island. Prof. True, of the National Museum, who has been studying the subject for years, says that, unless there is more use found for whale products and the industry is revived, they will soon be as thick in the coast waters as they used to be in the old days.

"The Prevention of Colds" was the subject of a recent paper read before the New York County Homeopathic Medical Society. In it the author declared that colds can be prevented by developing the elasticity and vigor of the skin. The skin should be prepared to meet and resist atmospheric cold by systematic and regulated exposures to cold treatment, which is easiest applied in the bath. We should begin, he said, with such a temperature as is easily within the reactive powers already present, when the time of exposure is properly regulated, and increase the demand for reactive effort as the ability to respond becomes greater. It is by a similar system that we develop the muscles. A case in point was that of a Boston man whose lungs, after an attack of pneumonia, were thought to be too much affected to bear another Northern winter. After spending several winters in the South, to the neglect of his business, he was hardened sufficiently for a Northern winter by trunk and spine rubbings twice a day, washing off with water gradually reduced in two weeks' time from 90° F. to 70° F., and maintained at this temperature all winter.

The investigation of food products recently set afoot by the Minnesota State Board of Health showed that the laboratory, rather than the field and dairy, is playing a principal part in supplying food. We quote: "Of 25 samples of baking powder, 2 were of phosphate, 4 cream tartar, and 19 alum baking powders. Of 23 samples of cream tartar bought of retail grocers, 2 only were fairly pure, 21 did not contain any traces of cream tartar, being composed of tartaric acid, acid calcium phosphate, and in some instances alum. Of 55 samples sold as cider vinegar, 11 were pure, 13 spurious cider vinegars made from the exhausted pomace from which the cider had been pressed, and 31 were colored low-wine vinegars, containing in some instances a small proportion of apple solids or cider vinegar. Three samples sold as malt vinegar were colored low-wine vinegars, 19 being below the legal limit of acidity. Of 68 samples of lard, 37 were adulterated with cotton-seed oil. Of 10 samples of olive oil, 6 consisted largely or entirely of cotton-seed oil, the other 4 being pure." The report says that all through the State impure goods are being sold for unadulterated goods.

Close observers have remarked at the comparatively rapid fading of blue flowers. H. Molisch, a German chemist, after careful study, declares it attributable to the action of alkalies on anthocyan. "Small quantities of alkalies," he says, "turn the purple anthocyan blue, while larger quantities render it green, yellow, and finally colorless. In nature this result is attained by the readmixture of the anthocyan with the protoplasm of other cells from which it was previously separated."

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR BUFFER.—Frank S. Way, Mount Vernon, Ill. This is a pneumatic buffer in which an air pipe extending under the car and charged with compressed air under the control of the engineer is connected by a valved branch pipe with the inner end of a cylinder under the car platform, the reciprocating piston of the cylinder being connected with the buffer plate.

ELECTRO-MAGNETIC SIGNAL. — Daniel S. McElroy, New York City. This invention covers a combination of a series of electro-magnets arranged parallel with the track, an alarm device carried by the locomotive, a chain connected to the alarm, and an armature supported by the chain within the influence of the magnets, with other novel features, whereby an operator at a station will be enabled to signal an engineer or attendant upon a train.

ELECTRO-MAGNET FOR RAILWAY SIGNALING. — Daniel S. McElroy, New York City. This magnet consists of a series of sections, each formed of a curved yoke having side extensions, and coils wound on the side extensions, the ends of the yoke and side extensions projecting beyond the coils, and the several sections being united, the magnet having cores greatly extended in one direction to lengthen the field of force to enable it to act upon a very long armature, or upon a short armature during its passage before the face of a magnet in the direction of its length.

RAILWAY TRAIN SIGNAL.—Daniel S. McElroy, New York City. This invention covers a signaling system for signaling from one train to another, or from a fixed point to any train, an insulated conductor being supported near the track and grounded at each end, a series of induction coils and a relay, a signal box and a generator, being carried on the train, and an electric current generator being arranged at a fixed station, with a signal box or annunciator, and a transmitting key.

ELECTRICALLY OPERATED SWITCH.—Daniel S. McElroy, New York City. A shifting bar connects the switch rails, a spring and electro-magnet alternately shifting the bar, an additional bar with apertures and spring-actuated bolt for locking it connecting the rails, while an armature is directly secured to the locking bar and a separate magnet directly controls the armature, whereby a switch and signal may be operated entirely by electric currents.

Agricultural.

CHECK ROW CORN PLANTER AND MARKER.—Franklin L. Menefee, Aurelia, Iowa. This invention relates especially to means for automatically reciprocating the marking bar from side to side, holding it in extended position when desired for a wire reel, and providing for the revolving of the bar, whereby the unwinding or taking up of the check wire may be effected, the improvements being also applicable in connection with seed-dropping devices.

Mechanical.

NUT LOCK.—Jeremiah G. Leep, Red House Shoals, West Va. This invention covers an improvement in that class of nut locks in which a dog is pivoted to the nut and its pointed free end held engaged with the thread of the screw bolt, the invention relating to nut locks in which the nut is locked on the bolt by a dog on the nut locking in a notch or recess in the bolt.

WELL DRILLING MACHINE.—John W. Miller, Newton Falls, Ohio. By this invention the winding drum is peculiarly constructed and arranged, with the means for lifting and dropping the drill rope, and a pulley is arranged to carry the rope as it passes from the drill-operating mechanism to the winding drum, whereby the rope is kept in the proper plane, and is fed down as the drill descends into the well.

DRILLING MACHINE. — Valentine Wirick, Rochelle, Ill. This is a machine to be used for boring wells, etc., and is designed to be very simple and durable in construction and effective in operation, the invention covering various novel details of parts and combinations thereof.

PULVERIZING MACHINE.—William H. Coward, Bath, Somerset County, England. This machine consists of a revolving drum having an edge roller running therein and provided with means for continuously supplying the material to be crushed and for removing the ground material without interrupting the working of the machine.

CARPET BEATING MACHINE. — Alexander B. Collen, New York City. This machine has a rotary carpet-supporting frame, with means for securing the carpet to the frame, in combination with rotary shafts having flexible beating arms and brushes mounted on the shaft, the brushes projecting alternately with the arms from the shaft, by which the carpet may be readily when being beaten and the work thoroughly done.

TINNER'S SEAMING MACHINES. — Peter W Allen, Pueblo, Col. This invention covers an attachment for double-seaming machines, the device being of novel construction and combined with the presser foot or roller, whereby the bottoms of tea kettles and similar vessels may be expeditiously and conveniently double-seamed to the body or breast, even when the breasts themselves have been double-seamed.

BUTTON SEWING NEEDLE. — Adolf Mandel, New York City. This needle has a longitudinally reduced butt, slotted to form two members with hook-like extremities, whereby the cord or thread may be quickly and firmly secured to the needle, and a smooth longitudinal surface be maintained from the shank to the point.

COTTON SEED LINTER. — Edward J. O'Brien, Texarkana, Ark. This invention covers an improvement on a former patented invention of the same inventor, designed to increase the capacity without calling for more power to drive the linter, there being two cotton seed receiving chambers, a vertical shaft carrying saws, and agitators within the cotton seed chambers.

Miscellaneous.

SIGN. — Frederick Mitchell, Yonkers, N. Y. This invention provides a background for the body of the sign whereby letters may be rapidly placed in position to construct words and sentences, and also quickly removed or shifted, it being also adapted for the arrangement of the letters horizontally or diagonally or in curves.

AUTOMATIC LAMP EXTINGUISHER. — Lyman B. Melius, Copake Iron Works, N. Y. By this invention a hood is arranged for connection with the wick tube and a weighted frame is arranged in connection with the hood, whereby the extinguisher will act automatically in case the lamp is unduly inclined from a vertical position.

SOFA BED. — George H. Skinner, Guelph, Ontario, Canada. This invention provides an article of furniture with which, when used as a bed, the entire upper surface will be soft, and the clothes will be free to hang down over the sides and the feet, and which may be utilized as a right or left armed lounge, or wherein two arms, one at each end, may be employed, as desired.

FLOORING.—Thomas Cantwell, Brooklyn, N. Y. By this invention wooden facing strips or blocks may be readily laid on concrete floors, as used in fireproof buildings, the strips or blocks being rigidly held to place, a series of longitudinally slotted tubes being arranged for connection with the base of the floor, while tie bars are arranged for connection with the facing strips or blocks, and fastening devices pass through the tie bars and engage the slotted tubes.

SCRUB BRUSH MACHINE.—Addison M. Cook, Bridgehampton, N. Y. This machine has a vertically reciprocating cutter under which is a horizontal slide, with a vise and rack engaged by a pawl pivoted to a lever, the latter connected to an operating rod, for making scrub brushes in which the splints are integral with the body or handle of the brush.

FLOUR BARREL.—Thomas L. Norman, West Point, Ga. This is a barrel or package formed of fabric and having its upper edge turned inward, with separable and removable inner and outer rigid head sections, between which inturned portions of the fabric extend, and removable fastenings connecting the head sections together and to the inturned portion, with other novel features, making a light and economical package, foldable in small space when not filled.

OBSTETRICAL APPLIANCE. — John P. Turney, Arlington, Oregon. This is a harness to be applied to the person of a woman when in childbirth, to facilitate labor, whereby the muscles may be braced for expulsive strains, the back supported, and a progressive pressure applied to the abdomen.

CARRIAGE TO RUN ON WIRE CABLES. —William Y. Cruikshank, Danville, Pa. This carriage is designed for the transportation of passengers and freight by means of wire cables stretched between two elevated points, the carriage being designed to travel in a horizontal plane and act as a brake on the down grade of the cables, and as a power on the ascending grade to assist in the forward motion.

COAL SEPARATOR. — Thomas H. Phillips and John E. Evans, Wilkesbarre, Pa. The separating chute has its bottom formed in sections with reverse curves, the convex portion being at the lower end, with an opening adjacent thereto and an adjustable apron hinged below the plane of the convex portion and partially closing the opening, for automatically separating coal from slate without the use of water.

FIRE PLACE DAMPER. — Edward O. Burrows, Orange, N. J. This is a device designed to be readily inserted in place and especially adapted for use with open grates, whereby the draught may be regulated by a person in the room, and accumulations of soot upon the damper or its frame will be avoided.

WASHING MACHINE. — Joseph Lachance, East Portland, Oregon. In this machine the clothes are beaten by balls and rubbed upon bars or rods, on the turning of a crank arm, the machine being designed to quickly and effectually wash the clothes without tearing or injuring them, and with a minimum of labor by the operator.

SKIRT PROTECTING GARMENT. — Elizabeth E. Wood, Topeka, Kansas. A flexible disk of rubber cloth, with apertures for the feet and ankles, is secured on its outer edges to the skirt of a waterproof cloak, straps from the disk passing upward to rings on a waistband, thus protecting the limbs and keeping the skirts clean and free from mud and moisture.

INKSTAND.—Emry Davis, Kane, Pa. In this inkstand there is a check in the ink passage through the float to prevent the ink from being forced in a jet up into the dip funnel, a double-walled cover forming a chamber to catch and return any overflow of ink, the construction being designed to avoid almost altogether the evaporation of ink.

HAIR TONIC.—Clemens Groos, Riverside, N. J. This tonic is designed to prevent the hair from falling out and promote new growth, thoroughly cleaning the skin to permit the hair roots to grow again, and consists of a composition of the pollen of the pine blossom, with spirits and water, combined and applied as specified.

GLOVE FASTENER.—George W. Jackman, Littleton, N. H. A cord is secured to one side of the glove opening and a flat thumb piece to the other side, with a holder adapted to produce friction on the cord, on drawing upon the free end of which the glove is closed and held closed, while upon lifting the thumb piece the cord is slackened or relieved of pressure to permit the opening of the glove.

WIRE STRETCHER.—Thomas P. Hickman, Savoy, Texas. This invention provides a device designed to carry the roll taut a sufficient distance beyond the post to conveniently nail the wire thereto, and whereby any amount of slack can be conveniently taken up, providing further for drawing together the broken ends of a wire and taking up the slack between the posts.

BILLIARD REGISTER. — Oliver G. Wilson, Franklin, Ky. By this invention duplicate registering devices are mounted in a suitable casing, adapted for attachment to a chandelier or to any convenient place, the devices being such that by turning a knob a hand is moved to a proper point on the dial, a bell being rung for each movement of a point, the hand being set at 0 at the commencement of the game.

METHOD OF HANGING TOBACCO. — Pleasant B. Farmer, Laurel Grove, Va. A cord is secured to one end of a tobacco stick, then passed around the stems of a bundle of tobacco against one side of the stick, and twisted, and passed similarly around a bundle of stems on the other side, thus proceeding on alternate sides until the stick is filled with bundles and ready to be hung up, the twisting of the cord causing each bundle to be perfectly encircled.

BUCKLE. — Charles W. Bassett, Alameda, Cal. This is a spring buckle consisting of an oblong plate of elastic sheet metal folded on itself to form a bent spring, slotted at the bend and the two ends, combined with a flexible tape, the device being especially designed as a buckle and strap for use as a bill file.

SCIENTIFIC AMERICAN BUILDING EDITION.

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NEW BOOKS AND PUBLICATIONS.

A MANUAL OF MACHINE CONSTRUCTION FOR ENGINEERS, DRAUGHTSMEN, AND MECHANICS. Embracing examples, rules, tables, and references. By John Richards Philadelphia: J. B. Lippincott Company. 1889. Pp. 153. Price $5.

Machine design, the transmission of power, steam machinery, hydraulics, properties of materials, and tables and memoranda are in brief the summary of this work. Every second page is blank, in order to receive the notes of the user. The system of numbering the pages and general arrangement of the work is, as stated in the preface, unique. Numerous illustrations are given, with tables of all the requisite data. It is an excellent book for the student or for preservation of notes in the drawing room of machine construction works.

NATURE SERIES. Modern views of electricity. By Oliver J. Lodge, D.Sc., LL.D., F.R.S. London and New York: Macmillan & Co. 1889. Pp. xvi, 424. Price $2.

Professor Lodge has been recognized as an expositor of the modern theory of electricity. In the field so well occupied by Hertz, his work has been of much importance as an independent elucidator, and also as an illustrator of Hertz's work. By his own original contributions thereto, he has greatly developed the ether wave theory of electro-magnetic induction. In the present work, the illustrations of electrical theories by the use of actual models, notably in the discussion in which he treats of the Leyden jar and its discharge, are certainly very interesting. We can confidently recommend the book to our readers as one that is well worthy the perusal of all who wish to become fully *au fait* in this branch of science. His weakness for using colloquialisms, which is now one of the prevailing habits in his country, is quite notable in his description of many experiments.

MONNAIE, MEDAILLES ET BIJOUX, ESSAI ET CONTROLE DES OUVRAGES D'OR ET D'ARGENT. By A. Riche. Paris: J. B. Bailliere et fils. 1889. Pp. 396.

This book is somewhat extensive in the ground it covers, first treating of numismatics, then of modern money systems, bimetallism and monometallism, extraction of precious metals, refining, mint processes, and counterfeiting. It also goes over the ground of mintage pretty thoroughly. The second part treats of jewels and medals, including assaying, by touchstone or otherwise, of precious alloys. Numerous illustrations are given to elucidate the matters treated.

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THE ALTERNATE CURRENT TRANSFORMER IN THEORY AND PRACTICE. By J. A. Fleming, M.A., D.Sc. (London.) Volume I. The induction of electric currents. London: The Electrician Printing and Publishing Company, limited. 1889. Pp. xi, 487.

This valuable book is published by the *Electrician*, of London. Its table of contents, which is very full, gives a good impression of the work. The phenomena of electro-magnetic induction, the theory of simple periodic currents, mutual and self induction, and the dynamical theory of current induction, which are the contents of the four chapters following the introductory one, gives some idea of the ground covered by it. It is very clearly and excellently arranged, and the illustrations given are precisely such as accord well with the matter of the book. Mathematics are used throughout and the differential calculus is applied where needed for the elucidation of the theory of the subject. An account of Hertz's experiments and researches is given a place, adding materially to the value of the book, and incidentally showing that it is well up to the times.

A MANUAL OF CHEMISTRY FOR THE USE OF MEDICAL STUDENTS. By Brandreth Symonds, A.M., M.D. Philadelphia: P. Blakiston, Son & Co. 1889. Pp. 154. Price $2.

This manual is intended for the use of students, but it gives a very concise and therefore useful summary of the full ground of chemistry, organic and inorganic. Its very shortness and conciseness give it value and make it as useful as convenient for students. In the way of analysis, a few tests are given, but this portion is, of course, comparatively meager.

COLCORD'S SYSTEM OF PRESERVING GREEN FORAGE WITHOUT HEAT OR FERMENTATION BY THE USE OF THE SILO GOVERNOR. By Samuel M. Colcord. Chicago, Ill.: Howard & Wilson Publishing Co. 1889. Pp. 160.

This work treats of a system of ensilage in which an attempt is made to preserve a constant condition of atmosphere within the mass of the silo by an apparatus termed the silo governor. Illustrations and letters from those who have tried the system are embodied in the work. This contribution to the literature of such an interesting subject is welcome and valuable.

MANUAL OF THE MAXIM AUTOMATIC MITRAILLEUSE, OR RIFLE CALIBER MACHINE GUN. By Hudson Maxim.

In this work a description of and short practical directions for the use of the Hiram Maxim gun are given. Illustrations of the mechanism and use of the piece, taken in part from the pages of this journal, are embodied in it, together with colored illustrations of the loading and discharging mechanisms. It is written and edited by the brother of the inventor, and will form a *sine qua non* to go with the piece or to be studied by those contemplating its use in regimental practice. To all interested in the developments of modern machinery ordnance and gunnery, the book cannot be too strongly commended.

MONOPOLIES AND THE PEOPLE. By Charles Whiting Baker, C.E. New York and London: G. P. Putnam's Sons. 1889. Pp. xv, 263. Price $1.25.

The associate editor of the *Engineering News* makes his appearance here in the role of a political economist, discussing the evils of trusts and monopolies, their different varieties, including those depending on the government, the evils of intense competition, and the palliatives and remedies for those ill effects. The last chapter is devoted to practical plans for the control of monopolies. Thus in the conclusion the work is very appropriately brought into the field of practical use.

HINTS ON HOUSE BUILDING. By Robert Grimshaw. New York: Practical Publishing Company. 1889. Pp. 77. Price $1.

These lively little "hints" contain much good sense of the variety generally termed "common sense," and are very well expressed. Those contemplating house building will do well to peruse the little volume, as they cannot fail to derive therefrom some ideas which will be valuable for the end they have in view. The author is better known as a writer on mechanical subjects, but this book shows that he can unbend to the consideration of everyday matters, and can so unbend with an unusual "quantum" of quiet humor.

THE ENGINEER'S HOURLY LOG BOOK. By Robert Grimshaw, M.E. New York: Practical Publishing Company. Price 50 cents.

This very useful book contains a series of pages ruled to have entered on them hourly data of the running of engines and boilers. The author's idea is, by the use of such works as this, to cause the engineer to do his work more systematically, and to make engineers preserve and record working data, by which their work will be rendered more intelligent and be subject to better supervision.

THE STORY OF THE BACTERIA AND THEIR RELATIONS TO HEALTH AND DISEASE. By Mitchell Prudden, M. D. New York and London: G. P. Putnam's Sons. 1889. Pp. 145. Price 75 cents.

Professor Prudden has been well known as one of the most indefatigable workers in bacteriology. The examinations of ice and water which he has made have attained considerable notoriety, and he has acquired a high reputation from the thoroughness of his investigations. In the present work air, water, ice, and food are considered as sources of bacterial infection. Bacteria in all their relations are here treated, and while it may have an alarmist tendency, it is a book which should certainly be read by all interested in biology or even by those interested in sanitary matters generally. The style of the work fits it for popular circulation, and we have no doubt it will attain considerable success in such a circle.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

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Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1454) H. L. H. writes: Has the impression of any figure been transferred to a clear sheet of glass by the agency of a flash of lightning (and under what circumstances)? A. We doubt it. The instances adduced of such action are not well proved. It is not at all clear how such action would be possible.

(1455) W. G. H. asks: Can you tell me what preparation there is that can be used on copper to make it retain its brightness when used on the outside of a building (covering the roof of a dome, and in ornamental bands)? A. The best you can do is to varnish it. Gilding may be resorted to where expense is not too great.

(1456) C. H. H. asks: 1. Should a cylinder be hot or cold when you set out the packing rings? A. It makes little or no difference. Convenience would suggest a cold cylinder, and in making mechanical adjustments they are always best executed when conditions are most convenient. 2. What will stop foaming in a boiler? A. Clean water. Add a little washing soda. This will make the foaming worse; after a few hours more blow out the boiler, wash out the bottom well, and fill with clean water. 3. Can you give a receipt for keeping apples through the winter in barrels? A. Bore holes in the bottoms and sides of the barrels, and store on a dry platform a foot or more high.

(1457) J. G. H. writes: While out to a ball one night the violin strings broke, and a friend of mine remarked that the cat's guts that they were made of were no good. I made him a bet that there was no part of a cat's guts entered into the construction of violin strings. Who wins the bet, and what are they made of? A. The intestines of cats are never used for violin strings. The favorite material for the gut strings is the intestines of lambs, the ileum, duodenum and jejunum. Silk is sometimes used for the core of the covered strings. You win the bet.

(1458) F. A. S. says: I have a transparency which hung in a window which was shaded by fir trees for three years, then the trees were cut down, and then the transparency began to fade out in a place. The place that began to fade is as big as a silver dollar. What made it fade, and can we do anything to prevent it? A. If the transparency was made on a gelatino-bromide plate, the fading may be due to insufficient washing after fixing. To check it, simply remove the transparency from the frame and immerse it in changing water for an hour and a half, then let it dry. Only a skilled photographer can change the stain, which will be difficult to accomplish. Probably the strong light hastened the fading.

(1459) M. B. asks for any process for crystallizing on plate glass, or, in other words, to make the glass appear frosted, not ground. A. Glass is treated in a variety of ways to obtain such effects. The sand blast may be used over a pattern. Treatment with hydrofluoric acid is often used. Sometimes strong solution of a salt, such as chloride of sodium or sulphate of soda, is allowed to evaporate upon it, and the plate is then exposed to the vapors of hydrofluoric acid. This produces characteristic designs. As a temporary expedient, painting may be employed. Sometimes glass is heated and cracked by sudden application of water. Then it is partially fused, so as to be made solid, while the marks of the cracks still remain.

(1460) F. B., Naples.—To introduce free fat acids from an oil, it must be decomposed. This may be done by the use of lead oxide and water or by analogous processes. To clarify an oil, expose to the sun in leaden trays. Often washing with water will answer the purpose. We can mail you "Animal and Vegetable Fats and Oils," by Brannt, price $7.50, which will give you much information on the subject you desire.

(1461) C. E. S.—No. 22 brass weighs 9¾ pounds to a square yard. No. 24 steel, 0·021 of an inch thick, weighs 7⅛ pounds to a square yard. Very thin steel can only be made in narrow strips and is not ordinarily in the market. It would be unfit for covering a boat.

(1462) R. H. asks: 1. Will you tell me how to take paint from muslin without injuring it? It is painted with white lead and iron paint. A. Benzine or chloroform may be used. Or soak the muslin in caustic lye, not too strong, until the paint softens, when you can wash it out. 2. How do naval builders know the exact draught of a vessel when they build one? Also the weight the vessels will bear after launching? A. By elaborate calculations of volume of the hull. 3. Is there any SCIENTIFIC AMERICAN SUPPLEMENT that contains articles about the balloon and how it is made and gas used? A. Many articles are contained on balloons as used by different nations in military service, etc.

(1463) A. M. M. asks: 1. Can I use electric light carbon in a battery? A. Yes. See SCIENTIFIC AMERICAN, October 27, 1888, and December 17, 1887. 2. Can I use unglazed flower pots in place of porous cells in battery? A. Yes, if you plug the holes in the bottom tightly. 3. Will a 7 inch screw wheel be large enough for a 14 foot rowboat to be driven by the electric motor described in your paper? A. No. Use at least a 10 inch screw.

(1464) M. R. asks how skeleton leaves are made. A. To make skeleton leaves, soak in rain water for some weeks, remove by floating upon a card, and very gently remove upper skin with a soft camel's hair brush. Float in water and catch on a card with the other side uppermost, and remove other skin and pulp. A stiff brush may be needed, to be used by dabbing. Do not touch with finger. Finally wash well, bleach with javelle water, wash and dry.

(1465) F. W. S. asks: 1. Can I make and sell any of those electric machines, such as dynamo in No. 161, SCIENTIFIC AMERICAN SUPPLEMENT, or plating dynamo in SCIENTIFIC AMERICAN of October 5, 1889, without infringing on anybody's patent? A. Yes. 2. Where can I get "Experimental Science," by G. M. Hopkins, and how much does it cost? Is it a book or paper? You refer to it on page 213, SCIENTIFIC AMERICAN of October 5, 1889, at the bottom of the page. A. "Experimental Science," is a book of 740 pages, published by Munn & Co. Price $4. 3. I have been rewinding a small medical battery. The secondary coil gives only a very small current. The primary coil, including interrupting arrangement, works all right. The primary coil consists of two layers No. 25 cotton-covered magnet wire, and is five-sixteenths inch diameter, including a soft iron rod. The secondary coil consists of a wooden tube, very thin in the center, and has 4 slots cut in it over its entire length. I wound on it 10 layers No. 36 silk-covered magnet wire, each layer covered with a layer of paper soaked in hot paraffine. The center hole is one-half inch diameter, to take in a brass tube of the same size, to check the secondary current. What changes would I have to make? Have you got a paper that treats on this subject? Please let me know the number, so that I can order it. A. Make the core of your primary coil of fine soft iron wires. It should be larger, say ⅜ inch. Wind it with two layers of No. 18 wire, and use a stronger battery, a plunging bichromate battery for example. 4. Does it make any difference if cable coils (see question No. 3) are wound in the same direction or not? A. No.

(1466) A. B. C. asks: Will you please state through the columns of your valuable paper what the E. M. F. of a bichromate of potash cell (one pint) having one zinc and two carbon plates 3×2×¼ inch (plunge battery) is? A. About 2 volts.

(1467) F. D. S. writes: 1. What relation does the size of a battery bear to the current produced? A. The larger a battery cell is, the more solution will it contain. A large cell will therefore run longer than a small one, other things being equal. The larger the plates are, the heavier is the current that will be given. Its amperage will be greater, its voltage will be unchanged. The ratio in general terms is one of simple proportion. 2. Is the fall of water from a siphon as great as the fall from a vessel placed at the bend of the siphon? A. Except for the additional friction in a pipe, it is the same. We do not understand what battery you refer to in your other query.

(1468) D. E. O. writes: When the brakes are applied to a running train of 12 coaches, what length of time is there between the action of the first and last brake beams, and if the compressor be stopped, what will be the indicated pressure when brakes are released? A. The pressure on the brakes takes place simultaneously. The pressure is a matter of regulation, due to the construction of the brake machinery, size of cylinders, etc. If the compressor is stopped with the brakes on, the release will depend for time on the leakage.

(1469) H. P. asks: 1. At what temperature does kerosene oil (150° test) vaporize? A. Such oil will boil at 350° to 450° Fah. 2. How many volumes does one volume of oil assume by vaporizing? A. About 130 volumes. 3. Does it leave any residue after complete vaporization? A. No.

(1470) Constant Reader asks: What number of the SCIENTIFIC AMERICAN SUPPLEMENT contains an article relating to the transferring of photographs to plates so that they may be printed? A. See SUPPLEMENT, No. 682.

(1471) H. D. H.—A nail driven into the trunk of a tree would thereafter remain at the same height from the ground, as the tree does not elongate upwardly by the formation of new tissues beneath, but through the formation of terminal buds, by which the axis is successively elongated.

(1472) F. B. says: In vol. 61, No. 9, of the SCIENTIFIC AMERICAN, article on "Transparencies in Prussian Blue," there is a formula calling for citrate of iron and ammonia 7½ drachms; is it a compound or is it two articles requiring 7½ drachms of each? A. Citrate of iron and ammonia is a single salt. 2. Will the formula mentioned do for sensitizing paper? A. Yes; also see SCIENTIFIC AMERICAN SUPPLEMENT, No. 584, and Notes and Queries column of SCIENTIFIC AMERICAN, October 12, 1889.

(1473) M. B. S. B. asks: What will remove iron rust stains from a polished marble slab? The slab was stained by allowing an iron oven to stand on it. A. We can suggest nothing better than rubbing with ground pumice or sapolio. Any chemical agent that would attack the iron would injure the marble also.

(1474) E. writes for the formula for making the lacquer or paint used in different shades, blue, yellow, green, etc., by lamp manufacturers and tinware manufacturers. A. In general terms an alcoholic solution of shellac colored with aniline colors may be used. Japans baked on are of course far superior.

(1475) D. J. B. asks: 1. How to set an eccentric on the main shaft of a steam engine before said shaft is set in place. A. Set the eccentric about 110° ahead of the crank line in the direction that it runs. This must be adjusted when the engine is set up to suit the requirements of the valve construction. 2. How is electricity applied to an electric motor in order to make the main shaft revolve? A. See illustrations of electric motors in back numbers of SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT.

(1476) L. M. R. asks: Which requires the most perfect joint to prevent leaking—hot water at 160° Fah., or steam at 5 to 10 pounds per square inch? A. Both require about equally perfect joints, for the water makes its way through an imperfect joint by capillary attraction.

(1477) C. De V.—External applications are rarely serviceable in erysipelas, or "St. Anthony's fire." The disease needs to be treated with refrigerant remedies, and requires the attention of a physician.

(1478) S. L. H. asks: 1. Where in this country is infusorial earth mined in large quantities? A. It is mined in Storey County, near Virginia City, Nevada, and on the Patuxent River, near Dunkirk, Calvert County, Md. A new deposit has recently been worked on Pope's Creek, Md. In 1887 about 3,000 tons were produced, estimated as worth about $15,000. 2. What are some of the principle uses to which it is put? A. For polishing powder (electro-silicon), absorbent base for dynamite, non-conductor for boilers and steam pipes, and filling for soap. 3. Are there any books giving information about this material and its mining? A. Statistics, etc., are given in the "Mineral Resources of the United States," published by the United States Geological Survey, Washington, D. C. 4. Is tripoli mined in this country, and what is its market value? A. Tripoli is a variety of infusorial earth formerly imported from the country of that name. We can supply you with Haswell's Engineer's Pocket Book, by mail for $4.

(1479) J. S. S. asks if there is a process known to you of photographing on brass so that it can be etched with acid, direct from the design without marking it on with a point or graver? A. Use the regular processes of zincography as described in our SUPPLEMENT, Nos. 143, 344, 438, 587, and 656.

(1480) Raj writes: Is there any known method whereby kerosene oil can be used for heating vulcanizers for dental or rubber stamp work without soot? Everything is black. I have used several different kerosene oil stoves, but all the same, everything in that part of my laboratory is all smut, and if I go that way I get daubed with black. I use it to boil water, heat flasks, soften rubber, and to vulcanize. We do not have gas or gasoline, but plenty of kerosene oil. A. There is no trouble in doing this. There are a number of oil stoves on the market that will burn oil without the least smoke. Some management is required. The wick should be kept trimmed, etc., but above all, the space above the flame should be as unobstructed as possible. If you place the article to be heated too near the flame or so as to obstruct the outlet smoking will occur. The top of the flame should be two inches or more from the surface to be heated.

(1481) J. W. N. writes: What articles are used in the manufacture of laundry starch. What quantities of each are used, and what ways and means are used for preparing it? A. Starch is a constituent of many vegetable products. Laundry starch is made on a large scale from Indian corn. The grain is ground, soaked in water, and the water milky with suspended starch is run off and allowed to settle, depositing starch upon the bottom of the vessels containing it. Various modifications, involving application of heat or chemicals have been proposed and introdueed to a considerable extent.

(1482) A. W. H.—The mineral sent is galena or sulphide of lead. It is the principal ore of lead, and is often worked for silver as well. If in any quantity it possesses considerable value.

(1483) G. J. L. asks: 1. What is the recipt for serpent's eggs, which when lighted give of a coil resembling a snake? A. In our SUPPLEMENT, No. 259, will be found the receipt asked for. As the mercurial fumes are unhealthy the following receipt may be used to make innocuous ones, almost as good as the regular. Bichromate of potassium 2 parts, nitrate of potash 1 part, white sugar 2 parts. 2. What is the melting point of lead? A. Lead melts at 630° F. 3. Shellac is composed of what? A. Lac is a resin which exudes from the stems of certain plants (*ficus*) when pierced by the *coccus* insect. It is collected and purified by melting, and is pressed into sheets forming shellac. 4. What is cresol? A. Cresol is a coal tar product of which several isomers exist. It is a derivative of benzol, one of the hydrogens of C_6H_6 being replaced by hydroxyl, and the other by methyl CH_3, thus C_6H_4, OH, CH_3. It is a liquid boiling at 365° to 366·8° F. in its other modification. It is a powerful disinfectant, and is very poisonous.

(1484) A. S. A. asks why water puts out fire? A. Water puts out fire by reducing the temperature. Water has a high specific heat, and cools off the wood or other combustible to such an extent that neither carbon nor hydrogen can combine with the oxygen of the air. A high temperature is essential for this to take place with a degree of energy sufficient to produce what we call fire.

(1485) A. L. L. asks: 1. Will you please advise me through the Notes and Queries column of your paper if the current from a glass plate electrical machine can be used for experiments in chemical electricity, such as decomposing water? A. To a very limited extent only. The very small intensity of the current makes it of very little power as regards chemical decomposition. 2. Have you ever given, either in the SCIENTIFIC AMERICAN or SUPPLEMENT, descriptions and illustrations of the different telephones? A. All electrical telephones are made upon the lines of the magneto telephone and microphone. In the columns of the SCIENTIFIC AMERICAN and SUPPLEMENT you will find an immense number of telephones described and illustrated. Consult our indexes. 3. Can you say where I can procure a receiving telephone of either of the above systems? A. They are not in the market. The Bell Telephone Company holds the monopoly.

(1486) W. H. M. asks (1) for the best method to shrink woolen goods. A. Two methods may be given: *a*. After pulling treat the goods on a perforated table with superheated steam. *b*. Pass through a bath of alum 10° B. for half an hour, wring and dry, wash, soap, wash off and dry. 2. State if there are woolen goods that cannot be shrunk. A. Almost all shrink more or less, the purest goods shrink the worst.

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(1487) A. C. F. asks how battery zincs are cast. In what kind of a mould? What can be mixed with it to make it softer? What is best to melt it in, and about how hot do you have to heat it? A. Zinc can be melted in an iron pot or ladle. It can be cast in sand moulds, although iron moulds are generally used. You should not mix anything with the zinc.

(1488) R. P. J. writes: Would it be practicable to use the eight-light dynamo with a 1 horse power Shipman engine for lighting dwelling? A. It could be used for this work. It would supply lamps of about 125 candle power.

(1489) J. A. T.—The window ventilating mills or fans are of no especial value as a means of ventilation. If there is a current of air naturally moving out or in through the hole, the mill moves. A plain opening with a guard to break or spread the direct current answers the same purpose as mills. Sunlight tends to crystallize the amalgam on mercury-backed mirrors.

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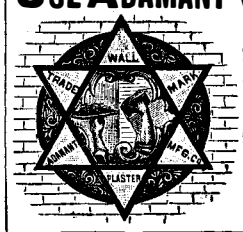

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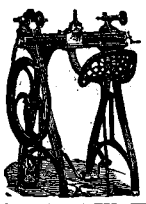

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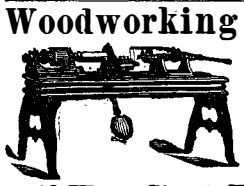

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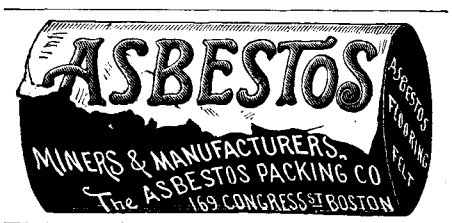

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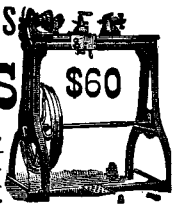

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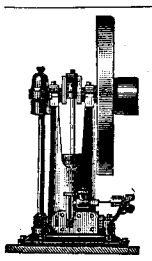

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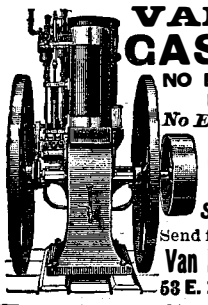

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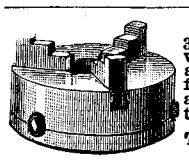

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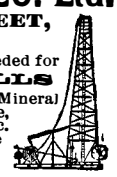

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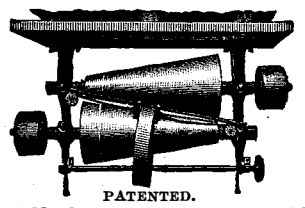

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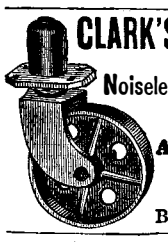

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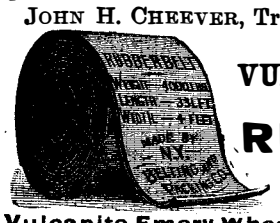

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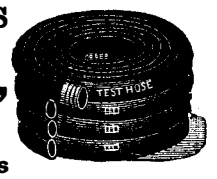

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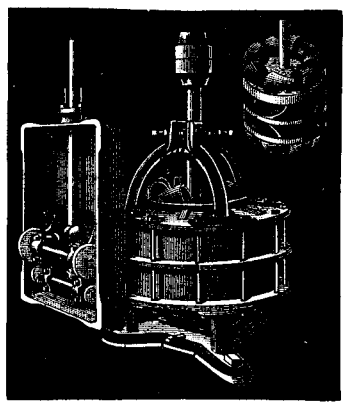

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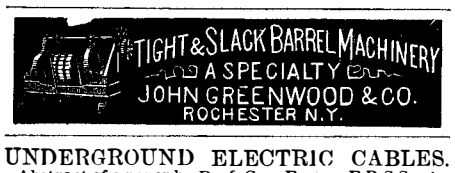

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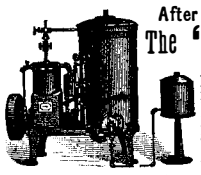

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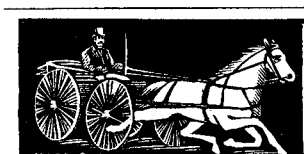

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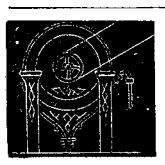

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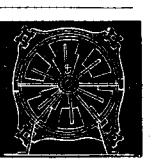

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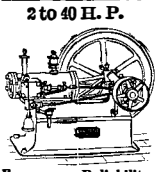

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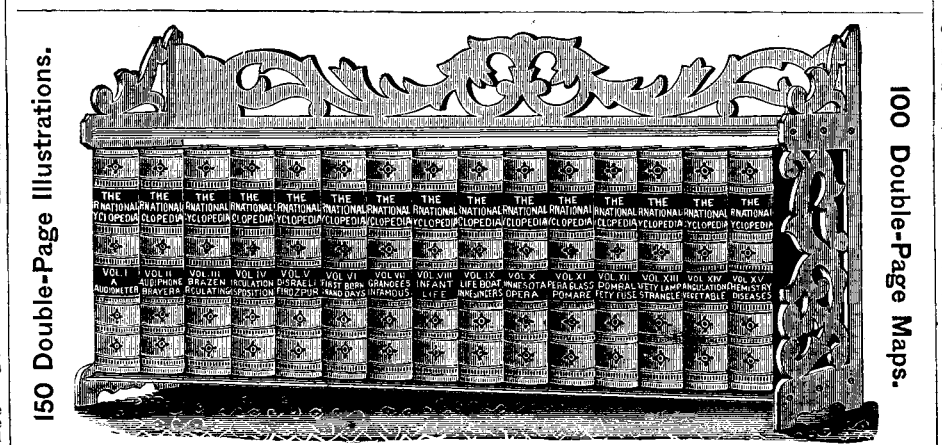

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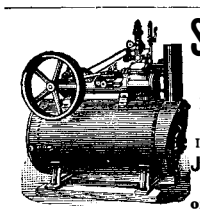

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